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● **Prevalence of Metabolic Syndrome among school children in Majmaah City, Kingdom of Saudi Arabia**

Fahad K. Aldhafiri

**IN THE NAME OF ALLAH,
THE MOST GRACIOUS,
THE MOST MERCIFUL**

Kingdom of Saudi Arabia
Ministry of Education
Majmaah University



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Editorial



From the desk of Editor.....

Salaam Alaikum,

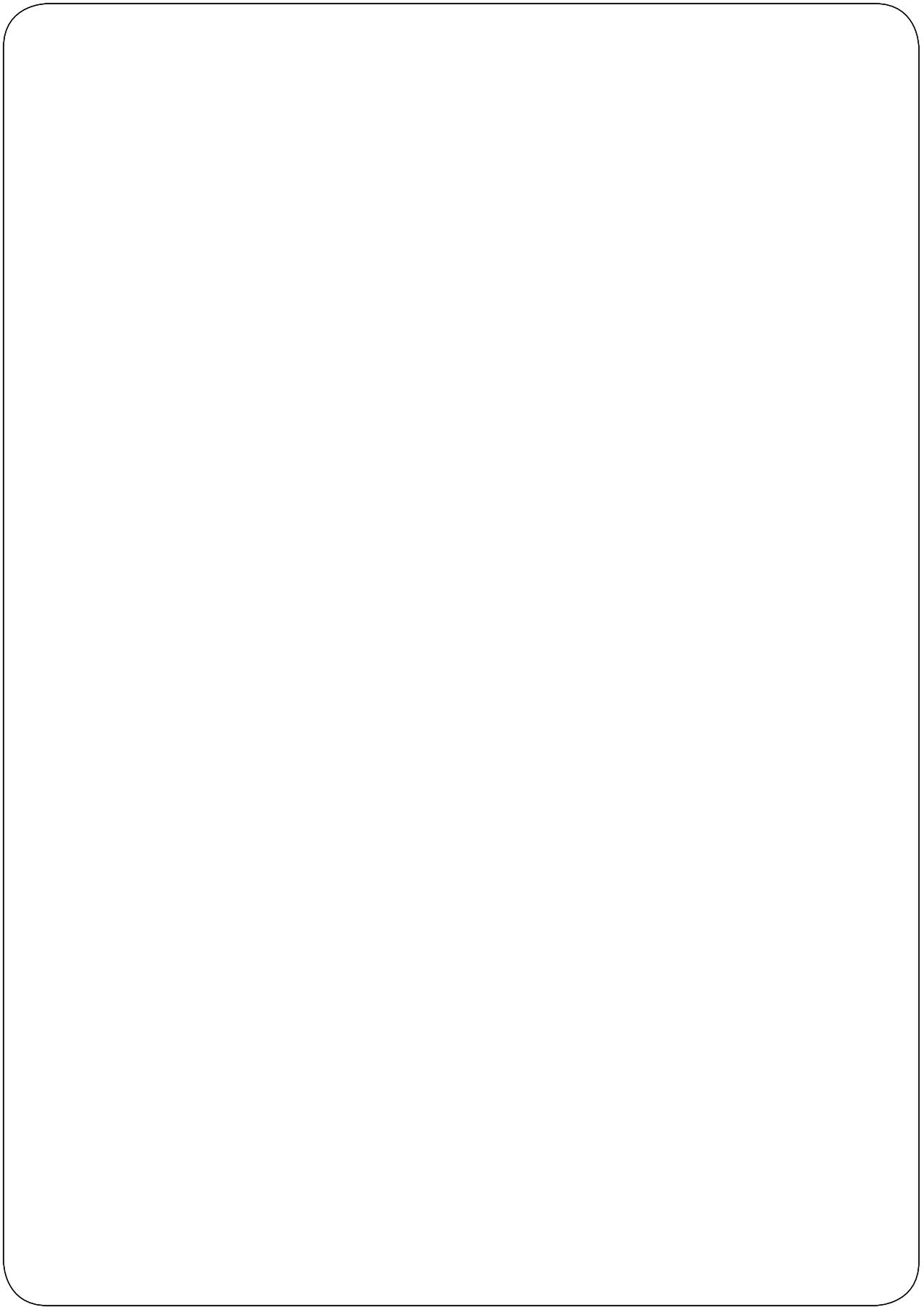
In the name of Allah, the most merciful and beneficent. It is a great privilege and responsibility bestowed on me as the editor in chief of this prestigious journal of our University. At the outset let me express my whole hearted gratitude to our beloved Rector Dr.Khalid Bin Saad Al Meqrin and the Vice Rector for graduate studies and Scientific Research Prof. Dr. Mohammad Bin Abdullah Al-Shaaya'a for their confidence in me. While assuming this responsibility I acknowledge the hard work and great efforts of my predecessors and members of journal committee.

In the modern concept of holistic health care, which is a comprehensive to total patient care aimed to achieve an optimal balance between body, mind, spirit and emotion. MJHS being a journal of health sciences is an ideal platform for all the branches that deals with this. Sir William Osler a Canadian physician, who is considered as one of the greatest icon of modern medicine said” He who studies medicine without books sails an uncharted sea, but he who studies medicine without patients does not go to sea at all”. As per his words MJHS provides space for articles of systematic reviews, meta-analysis and case reports. Any intellectual undertaking that involves asking and answering questions those results in a new knowledge or help in organizing existing knowledge is called Research. Without medical research there are no new medicines, no new materials, no improved treatments or better ways of providing health care. So MJHS is encouraging more original research articles.

I have a strong belief that research can and should be fun and there is an immense satisfaction in generating new knowledge and MJHS will be an ideal platform for emerging and established researchers to exhibit their research projects. I am very happy to announce MJHS is stepping towards having its own journal website with facilities for online submission and tracking systems managed by EJ manager. Believe that “the only thing that is constant is Change” (Heraclitus). MJHS is indexed in Copernicus and now heading towards online submission facility, next In-shallah will be able to get indexed in more reputable search engines. Your critics and feedback will help us improve.

Editor-in-Chief, MJHS

Professor. Dr. Mohammed HS Al-Turaiki



Contents

Editorial	v
Original Article	
The Ability of Dentists to Identify Psychiatric Symptoms in their Patients <i>Dr. Abdulrahman A. Al-Atram</i>	1
The Use of Nuclear Medicine In vitro Technology to Study the Effect of Malnutrition on children's Thyroid Function <i>Nagi I.Ali, Abdullah O. Alamoudi, Yousif Mohamed Y. Abdullah</i>	15
The quality of life of nursing students at the College of Applied Medical Sciences, Majmaah University: A cross-sectional study <i>Majed S. Alamri, Emmanuel D. Paragas, Jazi Alotaibi, Jamal Qaddumi</i>	21
Prevalence of Metabolic syndrome among school children in Majmaah city, Kingdom of Saudi Arabia <i>Fahad K. Aldhafiri</i>	34
An Assessment of Nutrition Education in Primary Schools and its Effect on Students Dietary Behaviors and Body Mass Index in Saudi Arabia <i>Ali S. R. Alsubaie</i>	45
Incidence trend of Cutaneous Leishmaniasis (CL) in Majmaah, Kingdom of Saudi Arabia <i>Rasheed Khalid Barradah</i>	57
Prevalence of mental distress among undergraduate medical students at Majmaah University, Kingdom of Saudi Arabia <i>Talal Alghamdi, Tahir Ansari, Fahad Alfahaid, Mansour Alzharani, Mohammed Almansour, Waqas Sami, Abdulkreem Alnasser, Ibrahim Almutiri, Turki Alanazi, Shoaib Albader</i>	66

Contents

Knowledge and Attitude of secondary school students in Sudair area, Saudi Arabia about Middle East Respiratory Syndrome Coronavirus (MERS-CoV)

Abdullah Ayidh Al-otaibi, Abdulmajeed Ali Al-zahrani, Hamad Abdullah Al-sheikh, Khalid Saud Al-shalhoub, Nashmi Nawaf Al-rashdi, Saad Abbas Al-dawsari, Elsadig Yousif Mohamed, Waqas Sami, Abdulrahman AlAjaji Saad Alflayyeh 76

Medical undergraduate's feedback towards Problem-based learning (PBL): College of Medicine, Majmaah University, Saudi Arabia

Mohammad Rehan Asad, Mohammad Al Mansour, Khwaja Mohammad Amir, Kamran Afzal, Ghassan Al Matlooby 87

Review Article

Neurodynamics and mobilization in Stroke Rehabilitation – A Systematic Review

Raid Saleem Al Baradie 99

The Privatization of Healthcare in selected First-world Countries and its Implications in the Kingdom of Saudi Arabia: A Descriptive-Comparative Study

Saad Alflayyeh 113

Publication Guidelines 128

Upcoming Conferences 135

Original Article

The Ability of Dentists to Identify Psychiatric Symptoms in their Patients

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ABSTRACT

Background and aims: Oral health plays an integral part in the general health of an individual. Moreover, a significant number of patients report to their dentist with signs and symptoms primarily of psychological origin. Identifying and treating such patients appropriately are a priority, so this survey was done to assess the ability of dental practitioners to identify patients with psychiatric problems.

Methods: A random sample of practising dentists in the Al Qassim province of Saudi Arabia was invited. The participants were then divided into three groups based on their clinical experience: Group I, with <5 years of experience; Group II, with 6–10 years of experience and Group III, with >10 years of experience. Chi-squared analyses were used. **Results:** Of the 150 dentists invited, 132 responded to the survey. Dentists in all groups encountered pa-

المخلص

الخلفية والأهداف: تعتبر صحة الفم جزء لا يتجزأ من الصحة العامة للفرد. وعلاوة على ذلك، فإن عددا كبيرا من المرضى يقومون بإبلاغ طبيب أسنانهم عن شكاوهم المتعلق بعلامات وأعراض تكون أسبابها في المقام الأول من أصل نفسي. ويعتبر تحديد ومعالجة هؤلاء المرضى على النحو المناسب أولوية، لذلك تم إجراء هذا المسح البحثي لتقييم قدرة أطباء الأسنان على تحديد المرضى الذين يعانون من مشاكل نفسية.

الطريقة: تمت دعوة عينة عشوائية من أطباء الأسنان الممارسين في منطقة القصيم بالمملكة العربية السعودية. ثم تم تقسيم المشاركين إلى ثلاث مجموعات على أساس خبراتهم السريرية: المجموعة الأولى ممن خبرتهم أقل من 5 سنوات. المجموعة الثانية مع 6-10 سنوات من الخبرة والمجموعة الثالثة تجاوزت خبرتهم 10 سنوات. واستخدمت تحليلات كاي التربيعية لتحليل النتائج.

النتائج: من بين 150 طبيب أسنان وجهت لهم الدعوة، أجاب 132 على المسح. وجد أن أطباء الأسنان في جميع

tients with mental health problems, and most focused on dental problems and ignored any psychological factors, stating that more time should be allocated to treat dental problems. They also noted that there was a lack of communication between dental practitioners and psychiatrists when cases were referred.

Conclusions: Early and appropriate recognition and management of psychological illness in patients with dental problems could help dentists provide treatment in a more holistic way. This can be facilitated by training dental practitioners to identify mental health problems in their patients and by ensuring that good communication exists between Dentists and Psychiatrists.

Keywords: anxiety, communication, depression dental practitioners, psychiatric disorders

الفئات قاموا بمعالجة المرضى الذين يعانون من أمراض نفسية ، وتركز معظم الأطباء على معالجة مشاكل الأسنان وتجاه لأي عوامل نفسية، وأشار هؤلاء الأطباء إلى أن هي نبغي تخصيص المزيد من الوقت لعلاج مشاكل الأسنان. وأشاروا أيضا إلى عدم وجود تواصل بين أطباء الأسنان والأطباء النفسيين عندما أحييت الحالات للعلاج النفسي.

الاستنتاجات: في وقت مبكر و مناسبة الاعتراف وإدارة المرض النفسي في المرضى الذين يعانون من مشاكل الأسنان يمكن أن تساعد أطباء الأسنان توفير العلاج بطريقة أكثر شمولية. ويمكن تسهيل ذلك من خلال تدريب ممارسي طب الأسنان على تحديد مشاكل الصحة العقلية في مرضاهم ، وضمان وجود اتصال جيد بين أطباء الأسنان والأطباء النفسيين.

الكلمات الدالة: القلق ،التواصل ،الاكتئاب، أطباء الأسنان الممارسين، الاضطرابات النفسية

INTRODUCTION

Oral health not only reflects the general health of an individual but also his or her overall mental status. Painful emotions, experiences, or behaviors can impair a person's life, such that he or she can no longer function properly. The prevalence of psychological

illness among patients presenting for dental care has been increasing in recent decades [1]. This may be due to self-neglect, which is often associated with mental illness, fear of dental treatment, lack of accessibility to dental treatment or side effects of psychiatric drugs [2]. Dentists can, in turn, experience

difficulties when trying to give a convincing explanation about the patient's symptoms, and they can face challenges in diagnosis and management.

In a study of 10,000 adults in the United Kingdom, Meltzer et al. reported a 16% point prevalence of psychiatric morbidity [3]. The psychiatric disorders most commonly encountered in dental practice are mood disorders, anxiety disorders, somatoform disorders, substance dependence disorders (e.g. alcohol, nicotine, or other drug dependencies) and eating disorders (e.g. anorexia nervosa and bulimia nervosa) [4]. Dentists should be comfortable with identifying psychiatric illness because of its association with oral health [5], such as the fact that psychological disorders such as anxiety and depression can lead to phobias and orificial pain during dental treatment. Oral manifestations of psychiatric illness also include burning mouth syndrome, erosions, dental caries, xerostomia, parotid gland enlargement and trauma to the oral mucosa.

Although dentists may recognise mental health problems in their patients, they are often inadequately trained to perform a

thorough assessment [6]. Drugs used in the treatment of psychiatric disorders can also result in oral symptoms, such as dryness, periodontitis and dental erosions [7]. Dentists should be aware that psychopathology can also interfere with dental treatment, often reducing compliance with preventive self-care and oral hygiene, which can further aggravate existing dental problems [8]. Therefore, simultaneous dental and psychiatric management can improve the holistic well-being of patients with mental health problems.

Patients with somatoform disorders usually complain of physical symptoms and request further investigation despite repeated negative findings. Dentists can then face particular difficulty when managing these patients [9], which can lead to less time being spent with them in the future. Social stigma is also becoming prevalent, so people may fear disclosing a psychiatric illness with their dentist [10]. Even after identifying stress and depression as contributory factors, patients can still be reluctant to be referred to a psychiatrist. At this point the dentist should educate patients about the role of psychological factors in oral disease and

convince them to seek the opinion of the psychiatrist, but many dental practitioners have a poor understanding of the role of psychiatric factors in oral disease. Difficulties can also arise if there is no interdisciplinary approach between dentist and psychiatrist.

This study was undertaken to assess the ability of dental practitioners to identify patients with psychiatric problems and how they manage the dental and psychiatric conditions in those patients.

Materials and Methods

In this cross-sectional descriptive study, dental practitioners were randomly selected from a list of dentists registered in the Al Qassim province of Saudi Arabia, using simple random sampling method. Both postgraduates (Master of Dental Surgery) and undergraduates (Bachelor of Dental Surgery) were included.

A semi-structured, multiple-choice, English-language questionnaire was printed and e-mailed to all study participants. The reliability of the obtained qualitative data was analyzed independently by a team that included two experts from the Department of Oral Medicine and Radiology, who had

a thorough knowledge of psychosomatic disorders, and by one clinical psychiatrist. Level of agreement was then assessed, and the validity of the collected data was standardised using a forced consensus approach [6, 10].

Only participants who completed the questionnaire were included, and non-responders were followed up with a maximum of two further e-mails. After receiving their responses, the participants were categorized into three groups based on the number of clinical experience. Group I, for practitioners with <5 years of experience; Group II, for practitioners with 6–10 years of experience and Group III, for practitioners with >10 years of experience.

Questionnaire responses were analysed statistically using SPSS Version 22.0(IBM Corp., Armonk, NY, USA), and chi-square tests were used to compare proportions between the three groups.

Results

A total of 150 dental practitioners were invited to participate. In total 130 ini-

tially responded to the sbut another two re-
sponded after receiving the follow up e-mails.
Thus, the final sample comprised of 132 den-
tists. The overall response rate was 88%, of
which 18%, 36% and 46% were from Group
I, II and III respectively

In this survey, all practitioners agreed
that psychiatric problems should be identified
in dental patients. Dentists in all three groups
had encountered patients with psychiatric
problems, with most agreeing that they
focused more on dental problems and ignored
psychological factors or related symptoms
(Fig. 1)

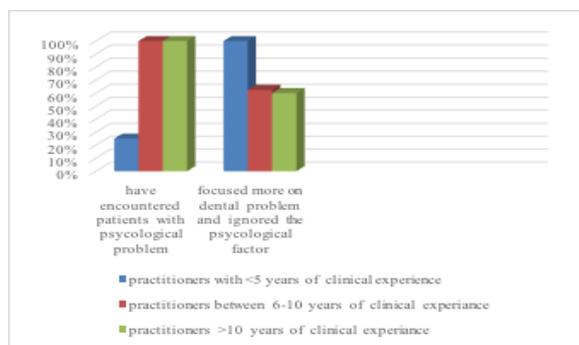


Fig 1: Percentage of dental practitioners who encountered patients with psychiatric problems

Whereas most practitioners identified psychi-
atric problems in Group II (62.5%) and Group
III (60%), practitioners in Group I identified
few patients (25%). However, all practitio-
ners agreed that dental conditions or diseases
can be associated with or cause psychiatric
problems ($p<0.001$; Table 1).

Table 1. The results of the questionnaire completed by dental practitioners

Sl.no.	Questions	<5 years (n = 24)		6 to10 years (n = 48)		>10 years (n = 60)		p-Value
		Yes	No	Yes	Nil	Yes	Nil	
1	Dentists who have encountered patients with psychiatric problem	6 (25%)	18 (75%)	48 (100%)	Nil	60 (100%)	Nil	<0.001
2	Practitioners focus only on dental problems and ignore the psychiatric related symptoms	24 (100%)	Nil	30 (63%)	18 (38%)	36 (60%)	24 (40%)	0.001

3	Time spend in diagnosing dental complains in psychiatric patients	Yes 24 (100%)	Nil	Yes 42 (88%)	No 6 (13%)	Yes 12 (20%)	No 48 (80%)	<0.001
4	8. Is an alternate treatment or placebo been delivered to a psychiatric patient	Nil	No 24 (100%)	Yes 24 (50%)	No 24 (50%)	Yes 12 (20%)	No 48 (80%)	<0.001
5	Referring the patient to psychiatrist is considered as social stigma	Yes 24 (100%)	Nil	Yes 18 (38%)	No 30 (63%)	Yes 18 (30%)	No 42 (70%)	<0.001
6	Is further training required for dental practitioner's to handle psychiatric cases	Yes 6 (25%)	No 18 (75%)	Yes 48 (100%)	Nil	Yes 54 (90%)	No 6 (10%)	<0.001

The most common psychological problems encountered in dental practice were dental anxiety and phobia, which were reported by 66% of dental practitioners (Fig. 2).

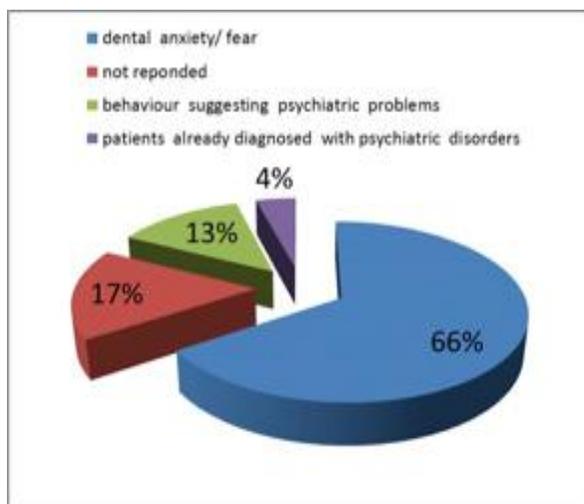


Fig 2: Psychiatric problems encountered in dental practice.

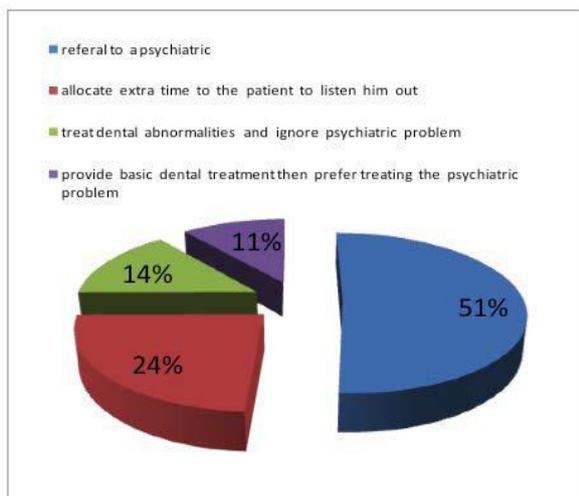
About 17% of practitioners did not respond to the question, another 13% stated that behavioral changes among their patients could indicate a psychiatric disorder and only 4% reported having treated patients with diagnosed psychiatric problems ($p<0.001$; Table 2).

Fig. 3 summarizes the role dental practitioners had in the management of psychiatric patients. Overall, 14% responded that they would provide treatment for dental-related problems and ignore the psychiatric illness. About 24% of practitioners agreed that they should allocate extra time to interact with psychologically ill patients, and 11% agreed

Table 2. The numbers of patients reported to attend dental clinics with psychiatric problems

Sl no.	Presentation	No. of participants according to the level of experience		
		Group I (n = 24)	Group II (n = 48)	Group III (n = 60)
a	Dental anxiety/fear	12 (50%), not responded (50%)	42 (88%)	36 (60%)
b	Anxiety depression due to life events	Nil	Nil	24 (40%)
c	Behaviour suggesting psychiatric disorders	Nil	Nil	Nil
d	Diagnosed psychiatric disorders	Nil	6 (13%)	Nil
e	Severe mental illness	Nil	Nil	Nil

that basic dental treatment should be provided before focussing on psychiatric treatment. However, 51% of the dentists preferred direct referral to a psychiatrist without offering any dental treatment.

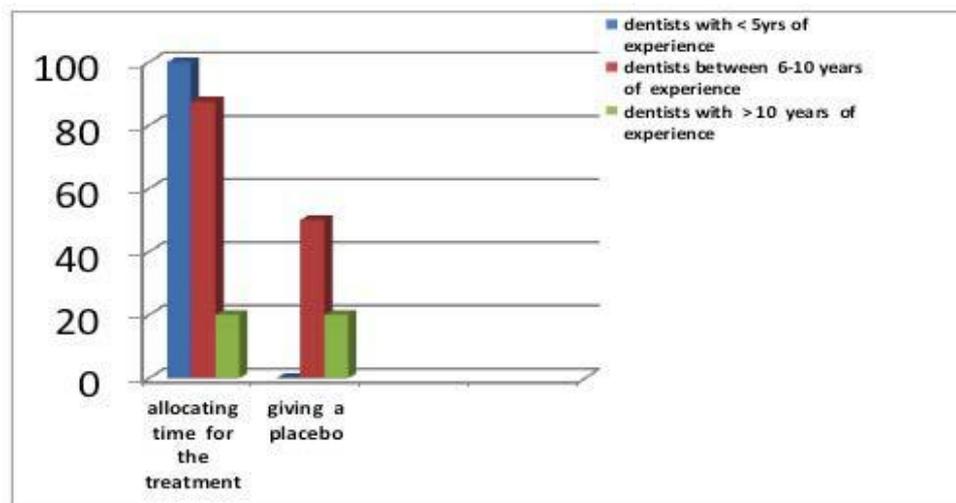
**Fig 3: Management of psychiatric patients by dental practitioners**

Practitioners in Group I preferred allocating their time to assessing the patient and referring them to a psychiatrist without any dental treatment (50%). Some practitioners in Group II would treat dental abnormalities before referral (13%), but most simply opted for direct referral (63%). In Group III, some would ignore psychiatric problems altogether and treat only the dental abnormalities (30%), some would treat and refer to a psychiatrist (20%), and some would refer directly to a psychiatrist (40%; $p < 0.001$; Table 3).

Table 3. Management of patients with psychiatric and related problems

Sl no.	Management	No. of participants according to the level of experience		
		Group I (n = 24)	Group II (n = 48)	Group III (n = 60)
a	Treat physical abnormalities and ignore psychiatric problems	Nil	6(12.5%)	18 (30%)
b	Provide basic treatment followed by psychiatric referral	Nil	6(12.5%)	12 (20%)
c	Allocate extra time to listen to the patient	12 (50%)	6(12.5%)	6 (10%)
d	Direct referral to a psychiatrist	12 (50%)	30 (63%)	24 (40%)

Fig.4 summarizes the various treatment options adopted by dentists when managing patients with psychiatric illness. All participants in Group I, 88% in Group II and 20% in Group III responded that sufficient time should be allocated to treat dental problems ($p < 0.001$). No dentist in Group I, 50% in Group II and 20% in Group III preferred treating patients with an alternative treatment or placebo ($p < 0.001$).

**Fig4: Treatment options adopted by the dentists in management of psychiatric patients**

Most participants (all dentists in Group I, 38% in Group II and 30% in Group III) believed that psychiatric referral was socially stigmatizing ($p < 0.001$). Most dentists also stated that they would prefer to undergo further training before managing psychiatric patients themselves ($p < 0.001$), and most felt that additional follow-up of psychiatric patients was helpful.

DISCUSSION

The oral cavity reflects a patient's general physical and mental health. Several studies have highlighted that patients with psychiatric problems are more vulnerable to dental problems, not least because they are more likely to neglect their oral health [11]. Moreover, the prevalence and impact of psychiatric disorders have been increasing in patients presenting to dental practices. A study by Goldberg et al. on common mental disorders revealed that in primary medical care settings, the total prevalence of psychiatric morbidity was as high as 23%–25% [12]. In other research, up to 30% of patients attending dental clinics have been recognized to have psychopathology that often goes undetected and untreated [13]. Typical complaints of

patients presenting to dental specialists with manifestations of underlying emotional disturbance are pain and abnormalities of sensation and salivation in the mouth.

Appropriate and early recognition of the emotional distress and suffering of patients would benefit both the patient and the health service [14]. It could also help the dentist to deliver appropriate treatment and management in a more holistic way. This is especially true if good professional communication exists between the dentist and a psychiatrist. However, certain factors appear to prevent the bridging of this gap [15]. This survey was therefore undertaken to evaluate the ability of dentists to identify psychiatrically ill patients who present to dental clinics and their awareness and knowledge in managing such patients.

The randomly selected dentists were categorized according to their experience level. Clinical experience was associated with value being placed on active listening and empathy. It is important for practitioners to elicit patients' perceptions of their illness, together with any associated feelings and expectations [15, 16]. Unfortunately,

because of the increase in technical expertise in dentistry, dentists may overlook their patients' psychological health. A void exists among dental practitioners when assessing psychological factors in their patients.

In this study, all dental practitioners expressed concerns when identifying patients with psychiatric problems. According to Friedlander et al., dentists should be concerned with the identification of depression because of its extensive association with dental disease. Common oral symptoms that manifest in patients who are mentally ill include facial pain, preoccupation with dentures, dry mouth, excessive palatal erosion, self-inflicted injury and dental diseases such as dental caries and periodontitis [17]. In this study, practitioners with more clinical experience could better identify patients with psychiatric problems ($p \leq 0.001$), probably reflecting the fact that patient-physician communication improves with clinical experience. Patients who understand their doctors are more likely to acknowledge their health problems, understand their treatment options, modify their behavior accordingly and follow their medication schedules [16].

It was also shown that most dental practitioners reported dental anxiety and phobias as the most common psychological problems encountered in practice. These results are in accordance with the study done by Gupta et al. in 2014, in which most patients who presented to a dental clinic with psychological disorders had anxiety and depression caused by a life event or an underlying emotional disturbance [10]. In the present survey, 13% of the participants stated that dental patients with psychiatric disorders displayed behavioral changes, but only 4% had encountered patients with a previously diagnosed psychiatric problem (most in Group II). This suggests that the prevalence of patients representing with psychological problems is increasing and that these patients do seek the help of a psychiatrist [5].

The present survey also revealed that most dental practitioners only focused on dental problems and ignored the psychiatric complaints of patients. A survey regarding dentists' approaches to patients with psychiatric illness concluded that there exists a need to allocate extra time to treat dental problems in these cases ($p \leq 0.001$) [17], and

that almost 50% of dentists would prefer to refer the patient directly to a psychiatrist to save time. All participants in Group I, 88% in Group II and 20% in Group III suggested that more time should be allocated for treating dental problems. In particular, practitioners with most experience (Group III) had difficulty in allotting extra time for the diagnosis and management of psychiatric patients because of their busy appointment schedule. By contrast, practitioners with less experience (Groups I and II) preferred to spend more time with their patients. It is recommended that dentists should spend much more time assessing psychiatrically ill patients, and that further treatment be planned in a proper way by collaborating with appropriate medical professionals [10].

Some practitioners opted to treat their patients with an alternative treatment or placebo to satisfy unusual requests ($p \leq 0.001$). Placebo or alternative treatment was not supported by any dentists in Group I but was supported by 50% in Group II and 20% in Group III. In 2009, as a complement to the population-based argument; David Feifel explored the ethical issues of placebo-controlled

studies as related to the individual psychiatric patients who participate in them. The rationale for including a placebo arm was based on the “greater good” argument focusing on the benefit derived by the population at large who were candidates for treatment with the investigational medication [18].

Most participants in this study believed that referral to a psychiatrist was associated with social stigma and stated that patients were reluctant to be referred when informed about their psychological problem. This is consistent with the perception that people who are labelled as mentally ill have more negative attributes and more societal rejection, regardless of their behavior [19]. Studies attempting to identify the reasons for psychiatric referral on medical wards have pointed to noncompliance and disturbed behavior as the main factors [20]. This study adds to this, showing that despite the ability to assess mental illness, there still exists a major gap in communication with appropriate medical professionals.

Most of the participating dentists felt that they lacked the competence to manage psychologically ill patients, so wanted further

training to improve their skills. Lack of formal training is a significant barrier that could be resolved simply by introducing dedicated training programmes designed to improve the understanding of the major diagnostic conditions and potential impacts of mental illness on oral health [20]. In such training, dental practitioners should be made aware of the side effects of common medications used to treat mental illness and how these interact with drugs used in dentistry.

Overall, patient compliance with preventive dental health programmes and drug therapy is central to their health and should not be ignored because of mental health problems. However, despite the interesting findings of this survey, a major drawback is that the included dentists could not assess compliance of patients with psychiatric problems. In this regard, further studies are warranted.

Conclusion

There is a need to know more about the intimate connection between oral and mental health. It is equally important that proper knowledge and training be imparted to undergraduate dentistry students by adding psychiatry to the curriculum. This,

in turn, would help upcoming dentists have better assessment skills for the management of patients who are psychologically ill. In tandem with this, steps should be taken to increase awareness among dentists about psychiatric disorders and their relationship to oral diseases. Interdisciplinary management between a dentist and psychiatrist can improve the overall well-being of a patient, which should be the therapeutic target regardless of whether the primary complaint is psychiatric or dental in origin.

References

1. Cross-national comparisons of the prevalence have and correlate of mental disorders. WHO International Consortium in Psychiatric Epidemiology. Bulletin of the World Health Organization. 2000;78(4):413-426.
2. Cormac I, Jenkins P. Understanding the importance of oral health in psychiatric patient. *Advances in Psychiatric Treatment*. 1999;5:53-60.
3. Office for National Statistics. (2003). *Psychiatric Morbidity among Adults Living in Private Households, 2000*. [data

- collection]. UK Data Service. SN: 4653, <http://doi.org/10.5255/UKDA-SN-4653-1>
4. [Brown.S, Greenwood M, &. Meechan J. G. General medicine and surgery for dental practitioners. Part 5 – psychiatry British Dental Journal (2010); 209: 11 - 16
 5. Settineri, S., Mallamace, D., Muscatello, M., Zoccali, R. and Mento, C. Dental anxiety, psychiatry and dental treatment: How are they linked? Open Journal of Psychiatry,(2013); 3: 168-172. Doi: 10.4236/ojpsych.2013.31A012.
 6. Lloyd-Williams F, Dowrick C, Hillon C, et al. A preliminary communication on whether general dental practitioners have a role in identifying dental patients with mental health problems. Ireland Mental health.British Dental Journal 2001;191: 625 - 629.
 7. Bergdahl M, Bergdahl J, Johansson I. Depressive symptoms in individuals with idiopathic subjective dry mouth. J Oral Path Med 1997; 26: 448–50
 8. Anttila S S, Knuutila M L, Sakki. Depressive symptoms as an underlying factor of the sensation of dry mouth. Psychosomatic Med. 1998; 60: 215–218
 9. Matthew Smith. Essential Human disease for Dentists 2006, Psychiatric Disorders, Chapter 14, Pages: 217–233.
 10. Gupta D, Sheikh S, Rashmi N C, et al. Assessment of the awareness of dental professionals regarding identification and management of dental patients with psychological problems in routine dental operatory: A Survey. Oral Health Dent Manag.2014;13(2):435-40.
 11. Tomar B, Bhatia NK, Kumar P, Bhatia MS, Shah RJ. The Psychiatric and Dental Interrelationship. Delhi Psychiatry Journal. 2011;14: 138-142.
 12. D. P. Goldberg, B. Blackwell. A Detailed Study Using a New Method of Case. Psychiatric Illness in General Practice: Br Med J 1970; 2:439-43
 13. Feinmann C The mouth, the face and the mind. (First edition): Oxford University Press;1999.
 14. Goldberg DP and Bridges K. Somatic presentations of psychiatric illness in primary

- care settings. *Journal of Psychosomatic Research* 1988; 32: 137-144.
15. Bathla M, Chandna S, Mehta D S, Grover H S *Dentistry and Psychiatry: It's Time to Bridge the Gap. Delhi Psychiatry Journal* 2015;18(1): 20 -24
16. John M Travaline, M D Robert Ruchinskas, Gilbert E D'Alonzo. Patient physician communication. Why and How? *Journal of the American osteopathic association*, January 2005;105: 13 -18.
17. Friedlander A H, West L et al. Dental management of the patient with major depression. *J.OralSurg Oral Med Oral Path*, 1991;71(5): 573–578.
18. David Feifel. The Use of Placebo-Controlled Clinical Trials for the Approval of Psychiatric Drugs Part II—Ethical Considerations Related to the Individual Participant. *Psychiatry*, 2009;6(12): 19–25.
19. Stiefel DJ, Truelove EL, Menard TW. A comparison of the oral health of persons with and without chronic mental illness in community settings. *Spec Care Dentist*. 1990; 10(1): 6-12
20. Fiske J, Lloyd H. Dental needs of residents and carers in elderly peoples' home and carers attitudes to oral health. *European Journal of Prosthodontics and Restorative dentistry*; 2: 91-95

Original Article

The Use of Nuclear Medicine Invitro Technology to Study the Effect of Malnutrition on children's Thyroid Function

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Abstract

In this study, forty-nine – under five years, male & female Sudanese children, presented with protein energy malnutrition (PEM, Kwash) according to the WHO criteria have been studied for their thyroid function and other biochemical Parameters. Triiodothyronine (T3), Thyroxine (T4) and Thyroid Stimulating Hormone (TSH), as a thyroid function indicators, the study-included determination of Thyroglobulin (TG), Ferritin, Protein Moreover, Hemoglobin levels in serum. The study was done in different hospitals in Khartoum state. Patients being assessed & examined by pediatricians using a unified clinical protocol and a questionnaire for patient's characteristics. Thyroid hormones and Ferritin were measured by a sensitive radioimmunoassay (RIA) Technique in 49 children with malnutrition as well as a control group of 20 healthy children. When the results of malnourished children compared to normal children showed that; 22% of malnourished children have sever hypothyroidism ($T4 < 30 \text{ nmol/l}$) and ($T3 < 0.5 \text{ nmol/l}$) as the reference range ($50 - 150 \text{ nmol/l}$) and ($0.8 - 3 \text{ nmol/l}$) respectively. The mean level of TSH for patients was within the normal range but

المخلص

تضمنت هذه الدراسة عدد تسعة وأربعين عينة مصل من الذكور والإناث الأطفال السودانيين (أقل من خمس سنوات) المصابين بسوء تغذية الخاص بنقص البروتين (كواش) وفقا لمعايير منظمة الصحة العالمية، تم دراسة العينات لمعرفة وظيفة الغدة الدرقية والمؤشرات الكيميائية الحيوية الأخرى مثل هرمونات الغدة الدرقية ثلاثي اليود (T3)، هرمونات الغدة الدرقية رباعي اليود (T4) والهرمون المحفز للغدة الدرقية (TSH)، هرمون الثيروجلوبولين (TG)، فيريتين (Ferritin)، ونسب الهيموغلوبين في المصل. أجريت الدراسة في مستشفيات ولاية الخرطوم المختلفة. تم تقييم وفحص المرضى من قبل أطباء أطفال متخصصين باستخدام البروتوكول السريري الموحد واستبيان خصائص المرضى. تم قياس هرمونات الغدة الدرقية والفيريتين بواسطة تقنية المناعة الإشعاعية (RIA) في ال 49 طفلا المصابين بسوء التغذية فضلا عن مجموعة الأصحاء (20 طفلا). كانت نتائج الأطفال الذين يعانون من سوء التغذية مقارنة مع الأطفال الأصحاء كالآتي: 22% من الأطفال الذين يعانون من سوء التغذية لديهم قصور في الغدة الدرقية ($T4 < 30 \text{ نانومول / لتر}$) و ($T3 < 0.5 \text{ نانومول / لتر}$) والمجموعة مرجعية (50 - 150 نانومول / لتر) و ($0.8 - 3 \text{ نانومول / لتر}$) لل $T3, T4$ على التوالي. كان مستوى الهرمون المحفز للغدة الدرقية (TSH) للمرضى في حدود المستوى الطبيعي ولكن كان أقل من متوسط مستوياته لدى مجموعة الأصحاء. وكانت القيم المتوسطة لهرمون الثيروجلوبولين (TG) وهرمون الفيريتين (Ferritin) للمرضى أعلى من تلك التي لدى مجموعة الأصحاء. أظهرت قيم البروتين والهيموغلوبين مستويات منخفضة لدى المرضى وذات ارتباط سريري سلبي بهرمون الفيريتين. استنتجت هذه

it was lower than the mean of TSH levels for controls. The mean values of TG and Ferritin for patients was higher than that of controls. Protein and Hemoglobin values showed low levels in Patients and negative clinical correlation between Ferritin and Hemoglobin has been found. Our conclusion of this study states that, malnutrition has severe effects on thyroid function.

الدراسة أن سوء التغذية له آثار سلبية على وظيفة الغدة الدرقية.

Introduction:

Malnutrition is one of the principal and extreme pathological disorders in comprehensive region globally. ⁽¹⁾ In a survey done by Food and Agriculture Organization (FAO) in 1996, ⁽¹⁾ several districts including Sudan presented high risk of insufficient nutrition. The incidence of protein energy malnutrition PEM in children under five of age in Khartoum state was likely 18.3% (4.5% severe, 13.8 moderate) ⁽²⁾. Malnutrition results mostly from relative or absolute deficiency of nutrients, and the most usually line of population exaggerated are children. ^(1,3)

The vital role of the thyroid hormones to children in stimulating growth and other functions is well-known, thyroid stimulating hormone (TSH), which secreted by the pituitary gland, stimulates the flow of T_3 and T_4 . Thyroglobulin is a large iodinated glycosylated protein; it is the storage form of T_3 and T_4 in the colloid of thyroid gland ^(3,4)

Total plasma protein test is used to diagnose impaired nutrition. Normal range of total protein in blood is between 6.4 – 8.3g/dl. Hemoglobin is the main carrier of oxygen and carbon dioxide in the blood as with hematocrit, it is an important determinant of anemia. The typical child with protein energy malnutrition (PEM) has a moderate anemia with hemoglobin concentration of about 8-10g/dl ⁽⁴⁾

Ferritin is found mainly in the cytoplasm of

reticulo-endothelial cell, liver cell, and too lesser extend in developing red blood cells precursors in bone marrow. It has normally been considered as storage compound from which iron is readily mobilized either into the transferrin-bound plasma pool or for intracellular heme synthesis. In simple iron deficiency, Ferritin concentration of <15mg/l indicate an absence of storage iron. In patients with iron overload high concentration of circulating Ferritin are found. In patient's infection, inflammatory disease, tissue damage or malignancy, the serum Ferritin concentration is still related to the level of iron store. ⁽⁵⁾

MATERIALS AND METHODS:

Study subject and selection criteria:

Forty-nine under five malnourished children were randomly selected for this study. The selected patients comprised males and females. Other 20 well-nourished children were selected to serve as control subjects. All patients participated in this study were seen at different hospital in Khartoum state, in which all clinical examination and assessment of disease were conducted by medical pediatricians. The subjects were also selected to be free of systemic or endocrine disease, and they were not under effect of any drug known to affect thyroid function.

Sample collection:

After the use of local antiseptic for skin

(70%ethanol), 3 ml of femoral blood sample were obtained by puncturing using disposable syringes. The serum was separated after centrifugation at room temperature and separated sera were kept frozen at -20°C until used.

Radioimmunoassay (RIA) method to measure serum T_3 and T_4 :

- T_4 (or T_3) radioimmunoassay method depend on the competition between I^{125} labeled T_4 (or T_3) and T_4 (or T_3) contained in standard or in specimens to be assayed for a fixed and limit number of T_4 (or T_3) antibody binding sites.
- After incubation, the amount of I^{125} labeled T_4 (or T_3) bound to the antibody is inversely related to the amount of T_4 (or T_3) present in the sample.
- In the antibody suspension of this kit, the antibody is covalently bound to the magnetic particle. Separation of the antibody bound fraction is achieved by magnetic separator and decanting the supernatant.
- By measuring the proportion of the I^{125} labeled T_4 (or T_3) bound in the present of references standards containing various known amount of T_4 (or T_3) the concentration of T_4 (or T_3) present in unknown sample can be interpolated.

Immunoradiometric assay method to measure TSH:

- Immunoradiometric assay for measuring TSH in human serum involves the reaction of TSH present in serum with monoclonal and polyclonal antibody.
- The monoclonal antibody is labeled with I^{125} (I^{125} -Mcab) and the polyclonal antibody is coupled to magnetic iron oxide particles (PcAb<M>).

- The formed I- Mc Ab-TSH-PcAb< M >complex (sandwich) is separated from unbound tracer by placing the assay tube in the magnetic separator decanting supernatant.
- The radioactivity of tracer in the tubes is directly proportional to the concentration of TSH in the specimen.

Immunoradiometric assay to measure Thyroglobulin (TG):

- The tubes were labeled for T (total account), standards, samples and control serum. Systematically the coated tubes allowed reaching room temperature before opening the bag.
- 100 μ l of each standard were added to corresponding tubes.
- 100 μ l of each sample or control serum were added into corresponding tubes.
- Incubation for an hour at room temperature on horizontal shaker.
- The incubation mixture of all tubes was decanted.
- 2ml of washing solution was added to each tube. Washed for one minute and decanted carefully.
- The washing procedure was repeated.
- 200 μ l I^{125} mAb tracer (red) was added to each tube.
- Incubated 2 hours at room temperature on horizontal shaker.
- The incubation mixture of all tubes carefully decanted.
- 2ml of washing solution was added to each tube, after one minute decanted carefully.

- The washing procedure was repeated.
- The radioactivity fixed in each tube was counted for one minute in Gamma counter.

Ferritin Measurement (Unit: µl)

Table (1) Radioimmunoassay to measure Ferritin levels in serum:

	T	NSB	S ₀	S t a n - d a r d	S a m - p l e
Incubation solution		200	100		100
Ferritin standard				100	
Sample					100
¹²⁵ I Ferritin	100	100	100	100	100
Ferritin Ab			100	100	100

Principles of total protein measurement:

Under alkaline conditions, substances containing two or more peptide bonds form a purple complex with copper salts in the reagent.

Table (2) Estimation of total serum protein methodology:

	Test	Standard	Blank
Sample	0.02 ml		
Standard		0.02 ml	
Distilled water			0.02 ml
Biuret reagent	1.0ml	1.0ml	1.0ml

The mixture incubated for 15min at 37C, and then absorption was read at 540 nm using spectrophotometer. Then the results were cal-

culated according to the equation:

$$\text{Serum total protein con. (g/dl)} = \frac{\text{Abs of sample} \times \text{conc. STD}}{\text{Abs of STD}}$$

Estimation of plasma hemoglobin using Cynomet Hemoglobin Method:

All form of hemoglobin reacts with drabkin solution to form stable color solution (cynomet hemoglobin).

Table (3) hemoglobin concentration methodology

	Test	Standard	Blank
Blood	0.02		
Standard		0.02	
Drabkin reagent	5ml	5ml	5ml

All samples incubated for 5min.

Calculation:

$$\text{H b con. (g/dl)} = \frac{\text{Abs of sample} \times \text{conc. of STD}}{\text{Abs of STD}}$$

Results and discussion:

Means of studied parameters level have been taken for patients group and compared with the means of control group, table (4) showed the comparison.

Table (4): means of the biochemical parameters for patients of control groups.

Sub-jects	T4 mmol/l	T3 mmol/l	TSH mIU/l	TG ng/ml	Ferr mg/l	Pro-tein g/dl	HB% g/dl
Patient	84.3	1.09	2.47	84.86	129.70	4.86	60.4
Control	98.0	1.62	2.80	34.04	65.88	6.73	85

Referring to the normal range of thyroid hormones among Sudanese children, T₃: 0.8-3/ mmol/l, T₄: 50-150 mmol/l as recorded by Nagi *et- al*, 2000, ⁽⁶⁾ the means of thyroid

hormones (T_3 & T_4) for the Two-study groups were in the normal range. Nevertheless, when we look to the patients individual results, 40% (11 out of 49) showed low levels of T_4 thyroid hormone– i.e. below the lower limit of the normal range. 37% (18 out of 49) of T_3 , while 10% exhibit low levels of both T_3 and T_4 .

6.25% (3 out of 49) of the patients were found to be complained of secondary hypothyroidism-low levels of T_3 , T_4 and TSH, which may indicates that the pituitary gland was also affected by malnutrition. Low TSH levels (figure 3) may be due to hypo-secretion of thyrotrophic releasing hormone (TRH) from the hypothalamus as mentioned in ^(7,8)

Upon the comparison of the means of protein and hemoglobin between patients and controls groups, patient group levels were below the normal range for the two parameters, which indicates the protein energy malnutrition (PEM) of the patients. This also told by Getahun et-al in .2017.

From the results, the patients group shows high levels of thyroglobulin TG (>60ng/ml). These high levels of TG among malnourished children may be due to the dysfunction of thyroid hormones. ^(8,9)

On the other hand, malnourished children showed high levels of Ferritin compared with the controls group, nearly two time, and table (4). This elevation of serum Ferritin among patient may be due to increase hemolysis of red blood cells, which caused by anemia in malnourished children.(This is not known in pure PEM) in addition, maybe because ferritin is acute phase reactant, & in PEM there are inflammatory changes . This finding is in agreement with Jain et-al in ^(10,11)

Conclusion:

- Form this study; the clear conclusion is that, there is significant ratio of severe hypothyroidism among the society of malnourished children on Khartoum state.
- So that it will be strongly recommended the routine investigation of thyroid function for the malnourished children immediately upon diagnosis by the pediatrician.
- The immediate treatment of hypothyroidism and follow up will be of a great benefit for children.
- It will be recommended to prevent protein energy malnutrition by availability of adequate nutrition, education of individuals of the importance of good nutrition and immunization, good surveillance is necessary to avoid periods of famine and follow the WHO priority program.

References:

1. Food and Agriculture Organization of the United Nations, FAO. The Sixth World Food Survey (FAO, Rome, 1996), pp. v-vi.
2. Alaverdashvili M¹, Li X², Paterson PG². Protein-Energy Malnutrition Causes Deficits in Motor Function in Adult Male Rats. *J Nutr.* 2015 Nov; 145(11):2503-11. Doi: 10.3945/jn.115.216382. Epub 2015 Sep 30.
3. Sawsan M. Abdullah nutritional assessment of children under 5 in Khartoum state,2000,MD,in community medicine
4. Clark clinical medicine, second edition, edited by Parveen J. Kumar and Michael L.
5. Correia, Maria Isabel TD, Mario Ignacio Perman, and Dan Linetzky Waitzberg.

- “Hospital malnutrition in Latin America: A systematic review.” *Clinical Nutrition* (2016).
6. N.I.Ali, Determination of the normal range of thyroid hormones in Sudanese by locally produced reagents, Fifth Arab conference on the peaceful uses of atomic energy, Beirut 13-17/11/2000.
 7. Poulia, Kalliopi-Anna, et al. “The two most popular malnutrition screening tools in the light of the new ESPEN consensus definition of the diagnostic criteria for malnutrition.” *Clinical Nutrition* (2016).
 8. Molin, M., Ulven, S. M., Dahl, L., Lundebye, A. K., Holck, M., Alexander, J. & Ydersbond, T. A. (2017). Arsenic in seafood is associated with increased thyroid-stimulating hormone (TSH) in healthy volunteers—a randomized controlled trial. *Journal of Trace Elements in Medicine and Biology*.
 9. Jain, R. B. (2017). Associations between the levels of thyroid hormones and lipid/lipoprotein levels: Data from National Health and Nutrition Examination Survey 2007–2012. *Environmental Toxicology and Pharmacology*, 53, 133-144.
 10. Pollit, Ernesto, and Dan Granoff. “Mental and motor development of Peruvian children treated for severe malnutrition.” *Revista Interamericana de Psicología/Interamerican Journal of Psychology* 1.2 (2017).
 11. Getahun, Z., Urga, K., Ganebo, T., & Nigatu, A. (2017). Review of the status of malnutrition and trends in Ethiopia. *The Ethiopian Journal of Health Development (EJHD)*, 15(2).

Original Article

The quality of life of nursing students at the College of Applied Medical Sciences, Majmaah University: A cross-sectional study

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Abstract:

Back ground: In Saudi Arabia, educational demands may become more challenging for students, and expectations may be more competitive than in previous academic experiences. Understanding students' quality of life (QOL) is important for the success of students and any academic institutions.

Aim & Methods: A cross-sectional study with a descriptive-comparative design was utilized to determine the QOL of 100 nursing students at the College of Applied Medical Sciences, Majmaah University. The Arabic version of the World Health Organization Quality of Life (WHOQOL-BREF) instrument was used in data collection.

Results: All nursing students had an average level in the four domains of QOL, which include physical health, psychological, social relationships, and environment. Female nursing students had a greater standard of QOL than their male counterparts, particularly in

المخلص

خلفية: في المملكة العربية السعودية، أصبحت المطالب التعليمية أكثر تحدياً للطلاب ، وقد تكون التوقعات أكثر تنافسية مما كانت عليه في التجارب الأكاديمية السابقة. ولذلك فإن فهم نوعية حياة الطلاب مهم لنجاح الطلاب والمؤسسات أكاديمية

الهدف والطريقة: تم استخدام دراسة مقطعية ذات تصميم وصفي مقارنة لتحديد 100 طالب وطالبة تمرير في كلية العلوم الطبية التطبيقية بجامعة المجمعة. واستخدمت النسخة العربية من أداة جودة الحياة لمنظمة الصحة العالمية في جمع البيانات

النتائج: كان لدى جميع طلبة التمريض مستوى متوسط في المجالات الأربعة في أداة جودة الحياة لمنظمة الصحة العالمية ، والتي تشمل الصحة البدنية والنفسية والعلاقات الاجتماعية والبيئة . وكان لدى طالبات التمريض مستوى أعلى من الذكور ، ولا سيما في الصحة البدنية والنفسية ، ومجالات العلاقة الاجتماعية. ومع ذلك ، في مجال البيئة ، كان لكل من الذكور والإناث نفس المستوى في أداة جودة الحياة لمنظمة الصحة العالمية. وعلى الرغم من أن طلبة التمريض الإناث لديهن درجات أعلى من الذكور ، إلا أن الفروقات في النتائج لم تكن معنوية.

physical and psychological health, and social relationship domains. However, in the environment domain, both men and women had the same level of QOL. Although female nursing students have a higher QOL scores than males, the findings were not significant.

Conclusion: This present study shows a relatively good social dimension in the QOL of nursing students in this university. These findings suggest that administrators and faculty should always consider the various dimensions of QOL among nursing students in implementing their institutional policies and procedures. Educators should provide students with several opportunities to nurture their different skills, while considering QOL in setting both extracurricular and academic requirements.

Keywords: Quality of life, Nursing students, Physical health, Psychological health, Social relationship, Environment

مستخلص الدراسة :

تبين هذه الدراسة وجود بعد اجتماعي جيد نسبيا في كلية العلوم الطبية التطبيقية لطلبة التمريض في جامعة المجمعة. وتوحي هذه النتائج بأن على الطلبة وأعضاء هيئة التدريس أن يأخذوا في الاعتبار الأبعاد المختلفة لقيمة طلبة التمريض في تنفيذ سياساتهم وإجراءاتهم المؤسسية. يجب على إخصائي التوعية تزويد الطلاب بعدة فرص لتعزيز مهاراتهم المختلفة ، مع الأخذ بعين الاعتبار مستوى الجودة في تحديد المتطلبات الأكاديمية والأنشطة اللاصفية.

Introduction

Quality of life (QOL), as defined by the World Health Organization (WHO), is an individual's perception of their position in life in the context of the culture and values systems, in which they live in connection with their goals, standards, and concerns [1]. Also, QOL is comprised of the achievement of human needs, such as a satisfying material life, health, education, security, clean environment and aesthetic and spiritual needs [2].

In Saudi Arabia, as around the world, the transition of students from high school to college is life-changing experience. Their biggest adjustment is adapting from the previous mode of teaching — especially when the medium of instruction shifted from Arabic to English — as well as with the higher level of learning in colleges and universities. Educational demands may become more challenging for them, with higher, more competitive expectations than in their previous

academic environments. Aside from this adjustment, most college students are in the transition from adolescence to young adulthood. This alone has been linked to stress that can result in depression, which is believed to be a public health problem and one of the leading causes of disability worldwide [3]. Moreover, Pozderac [4] posits that faulty lifestyle, such as inversion of sleep, smoking and presence of stress-related exams, can adversely influence the cardiac health of students. Understanding how some of these factors can impact an individual's QOL is important for any academic institutions.

Nursing students in particular are at an essential stage of learning, and clinical practice is vital for them to mature and develop significant values to become a caring competent nurse. Hence, their health status during this period affects their attitudes in clinical practice as well as their career values. Moreover, there is a possibility that the low QOL during clinical practice discourages the students to continue their career in nursing; thus, it is imperative for nursing educators to understand and value the importance of the QOL of the nursing students. However, only quite a few studies have been accomplished to measure the QOL of the nursing students [5]. Therefore, the aim of this study is to determine the QOL among nursing students at Majmaah University, College of Applied Medical Sciences. The findings of this research would be a valuable contribution to the awareness of the nursing educators and administrators of

this institution regarding the current status of QOL of the nursing students. Specifically, this study could help them to make better learning opportunities and necessary programs to enhance the QOL of the nursing students, thereby increasing their satisfaction and sense of accomplishment.

Methods

Design

This research was designed as a cross-sectional descriptive comparative study to determine the QOL of nursing students at the College of Applied Medical Sciences, Majmaah University.

Sample

One hundred nursing students in both the male and female departments responded anonymously to a questionnaire. The following inclusion criteria were applied: (1) Saudi Arabian; (2) currently enrolled in the nursing program; and (3) able to read and sign an informed consent and to complete successfully all the research instruments written in Arabic. This study focuses more on gender due to some inconsistencies in the literature whether males have a higher QOL than females, and vice versa.

On the other hand, a *priori* power analysis was conducted using G*Power 3 statistical software to determine the appropriate sample size. The following elements were used: (1) medium effect size of 0.5; (2) power of 0.80; and (3) level of significance at 0.05. It

was revealed that there should be at least 100 participants to achieve the power of at least 0.80. Medium effect size was used due to the limited number of studies which investigated the QOL of nursing students.

Instrument

An Arabic version of the WHO Quality of Life (WHOQOL-BREF) instrument was used in data collection. The WHOQOL-BREF is a well-established cross-culturally accepted international instrument to assess QOL. Developed by the WHO, it is composed of 26 items and is offered in diverse languages for both developed and developing countries. The composition of the four domains in the instrument made it suitable to determine the QOL of the nursing students since the QOL encompasses the attainment of basic human needs, such as material life, health, education, security, clean environment and aesthetic and spiritual needs [2].

The instrument comprises four domains: First, the physical health which covers activities of daily living, dependence on medicinal substances and medical aids, fatigue, mobility, pain and discomfort, sleep and rest, and work capacity. Second, the psychological health includes bodily image and appearance, negative feelings, positive feelings, self-esteem, spirituality, thinking, learning, memory and concentration. Third, the social relationship comprises personal relationship, social support, and sexual activity. Lastly, the environment involves financial resources, freedom, physical safety and security, health

and social care, home environment, opportunities for acquiring new information and skills, participation in and opportunities for recreation, physical environment, and transport.

Response options on a 5-point Likert scale range from 1 (very poor/very dissatisfied/not at all) to 5 (very good/very satisfied/an extreme amount). The raw score on each domain was converted, from 0 being the least favorable to 100 being the most favorable, using the transmutation table.

Data Gathering Procedure and Ethical Considerations

A written approval to conduct the study was obtained from the Dean of the College of Applied Medical Sciences, and the Ethics Review Board. A copy of the instrument was submitted for review. Signed informed consent was secured from students, and anonymity and confidentiality were assured before their participation in the study. Data collection was done in the classroom wherein students independently answered the questionnaire, which took 10-15 minutes. The response rate was 95.24%.

Data Analysis

Descriptive statistics, using frequencies, percentages, means, standard deviations (SD), and mean differences were performed to examine the students' responses. To determine the QOL scores for each domain, means and SD with transmutations values, as recom-

mended by the WHO, were calculated. The differences in QOL scores based on gender were analyzed using the independent *t*-test with 95% confidence interval (CI). All analyses were considered significant when *p*-value was <0.05 . All data were analyzed using IBM SPSS Statistics (IBM Corp., Armonk, NY) version 23.0.

Results

Gender

Participants included 100 nursing students (male, 66%; females, 34%) with age range between 19 and 35 years (mean age, 21.36; SD ± 2.01).

Physical Domain

Table 1 shows that 35% of students are not experiencing any pain or discomfort, and 25% are experiencing only a little amount, but 9% are suffering “very much” to “extreme level” of pain and discomfort. On the other hand, more than half of students (51%) expressed no dependence on medical treatment, while 43% reported “a little” to moderate reliance on medical care.

Less than half of students (47%) had a moderate amount of energy, and 41% reported having “very much” to “extreme level” of energy for everyday life. Half of students

Table 1. The quality of life scores of nursing students in the physical domain (n=100)					
Questions	No. of respondents (%)				
	Not at all / Very Poor / Very dissatisfied / Never	A little / Poor / Dis- satisfied / Seldom	Moderately / Neither / Quite Often	Mostly / Very Much / Good / Satisfied / Very Often	Completely / Extremely/ Very Good / Very Satisfied / Always
To what extent do you feel that physical pain prevents you from doing what you need to do?	35 (35)	31 (31)	25 (25)	7 (7)	2 (2)
How much do you need any medical treatment to function in your daily life?	51 (51)	29 (29)	14 (14)	6 (6)	0 (0)
Do you have enough energy for everyday life?	4 (4)	8 (8)	47 (47)	29 (29)	12 (12)
How well are you able to get around?	5 (5)	6 (6)	39 (39)	36 (36)	14 (14)
How satisfied are you with your sleep?	8 (8)	22 (22)	32 (32)	30 (30)	8 (8)
How satisfied are you with your ability to perform your daily living activities?	(3) 3	(13) 13	(40) 40	(36) 36	(8) 8
How satisfied are you with your capacity for work?	(4) 4	(13) 13	(29) 29	(44) 44	(10) 10

(50%) classified mobility as “good” to “very good”, while 39% said it was neither poor nor good. It is noteworthy that satisfaction with sleep and rest seemed to be evenly divided among those surveyed; only 38% of students are satisfied to very satisfied with their sleep and rest, 32% are sometimes satisfied and sometimes dissatisfied, and 30% are dissatisfied to very dissatisfied.

Of students surveyed, 44% are satisfied to very satisfied with their ability to do their activities of daily living, 40% are sometimes satisfied or sometimes very dissatisfied. Meanwhile, more than half (54%) of students said they are satisfied to very satisfied with their capacity to work, while 29% are in the middle of being satisfied and dissatisfied.

Table 2. The quality of life scores of nursing students in the psychological domain (n=100)

Questions	No. of respondents (%)				
	Not at all / Very Poor / Very dis- satisfied / Never	A little / Poor / Dis- satisfied / Seldom	Moderately / Neither / Quite Often	Mostly / Very Much /Good / Satisfied / Very Often	Completely / Extremely/ Very Good / Very Satis- fied / Always
How much do you enjoy life?	(3) 3	10 (10)	38 (38)	42 (42)	7 (7)
To what extent do you feel your life to be meaningful?	(5) 5	(6) 6	(32) 32	(37) 37	20 (20)
How well are you able to concentrate?	5 (5)	12 (12)	46 (46)	30 (30)	7 (7)
Are you able to accept your bodily appearance?	3 (3)	12 (12)	17 (17)	46 (46)	22 (22)
How satisfied are you with yourself?	3 (3)	10 (10)	13 (13)	47 (47)	27 (27)
How often do you have negative feelings such as blue mood, despair, anxiety, depression?	5 (5)	43 (43)	30 (30)	16 (16)	6 (6)

Psychological Domain

Table 3. The quality of life scores of nursing students in the social domain (n=100)					
Questions	No. of respondents (%)				
	Not at all / Very Poor / Very dis- satisfied / Never	A little / Poor / Dis- satisfied / Seldom	Moderately / Neither / Quite Often	Mostly / Very Much / Good / Satisfied / Very Often	Completely / Extremely/ Very Good / Very Satis- fied / Always
How satisfied are you with your personal relationships?	3 (3)	(12) 12	(25) 25	(37) 37	23 (23)
How satisfied are you with your sex life?	17 (17)	(12) 12	(19) 19	32 (32)	20 (20)
How satisfied are you with the support you get from you friends?	7 (7)	15 (15)	29 (29)	32 (32)	17 (17)

In Table 2, almost half (49%) of students classified their enjoyment of life as “very much” to “extreme amount”. However, 48% described having a “little” to “moderate amount” of enjoyment. More than half (57%) of respondents felt their lives were meaningful.

Further, 37% of students revealed they were able to concentrate on their activities, but 46% expressed they were able to concentrate but only to some extent. The majority of students (68%) accept their body image and appearance, and students are satisfied (74%) with themselves. In addition, almost all students (73%) expressed that they experience negative feelings about themselves from

“seldom” to “quite often”.

Social Domain

More than half of students (Table 3) conveyed they are “satisfied” to “very satisfied” with their personal relationships (60%), as well as with their sex life (52%). However, 25% and 19% respectively, are neither satisfied nor dissatisfied with their personal relationships and sex life. On the other hand, almost half (49%) of students are “satisfied” to “very satisfied” with the social support they receive from their friends, while 29% are neither “satisfied” nor “dissatisfied”.

Table 4. The quality of life scores of nursing students in the Environment Domain ($n=100$)

Questions	No. of respondents (%)				
	Not at all / Very Poor / Very dissatis- fied / Never	A little / Poor / Dissatisfied / Seldom	Moderately / Neither / Quite Often	Mostly / Very Much /Good / Satisfied / Very Often	Completely / Extremely/ Very Good / Very Satisfied / Always
How safe do you feel in your daily life?	5 (5)	2 (2)	14 (14)	34 (34)	45 (45)
How healthy is your physical environment?	7 (7)	17 (17)	47 (47)	22 (22)	7 (7)
Have you enough money to meet your needs?	7 (7)	23 (23)	44 (44)	20 (20)	6 (6)
How available to you is the information that you need in your day-to-day life?	2 (2)	13 (13)	53 (53)	28 (28)	4 (4)
To what extent do you have the opportunity for leisure activities?	11 (11)	29 (29)	41 (41)	15 (15)	4 (4)
How satisfied are you with the conditions of your living place?	5 (5)	9 (9)	15 (15)	43 (43)	28 (28)
How satisfied are you with your access to health services?	5 (5)	10 (10)	25 (25)	39 (39)	21 (21)
How satisfied are you with your transport?	9 (9)	13 (13)	20 (20)	30 (30)	28 (28)

Environment Domain

In Table 4, a majority of students (79%) feel they are safe. Nearly half (47%) reported their home environment is moderately good, and only 27% claimed to have a good to very good home environment. Finances were a different matter; 67% of students declared they have a little to moderate amount of financial resources.

It is noteworthy that 66% claimed they have low to moderate opportunities for acquiring new information and skills, while 32% reported having experienced

opportunity “mostly” to “completely”. Further, 70% expressed having little to moderate opportunities to participate in leisure activities.

Students stated they were “satisfied” to “very satisfied” in their home environment (71%) as well as with the accessibility and quality of health services (60%). Also, more than half (58%) of students were satisfied to very satisfied with their transport.

Domains	Male (n=66)			Female (n=34)		
	Mean	Standard Deviation	Transmutation (100 scale)	Mean	Standard Deviation	Transmutation (100 scale)
Physical Health	20.27 / 35	3.69	44	21.06 / 35	2.41	50
Psychological	20.35 / 30	4.32	56	20.94 / 30	2.40	63
Social Relationship	10.12 / 15	3.12	56	10.59 / 15	2.24	69
Environment	26.89 / 40	5.80	63	27.18 / 40	3.72	63

Overall QOL scores in the four domains

The WHOQOL-BREF has four domains: physical health, psychological health, social relationship and environment. The mean scores in the four domains for male and female nursing students are presented in Table 5. Male nursing students obtained the highest transmuted score in the environment domain (63%), followed by both the psychological and social domains (56%). The scores, as mentioned earlier, can be interpreted as above

average. However, it is noteworthy that scoring in the physical domain was lower (44%), and is considered to be below average.

Female nursing students attained the highest transmuted scores in the social domain (69%), followed by the psychological and environment domain (63%), which were considered above average. Similar with male nursing students, the women had the lowest score in the physical domain (50%); however, their scores were average.

Domains	Mean Difference	95% Confidence Interval	<i>p</i> -value ^a
Physical	-0.79	0.60 , -2.17	0.26
Psychological	-0.59	0.99 , -2.18	0.46
Social	-0.47	0.73 , -1.66	0.44
Environment	-0.29	1.89 , -2.46	0.80

^a*t*-test, significant at <0.05 level

The difference in the overall QOL scores in the four domains

Table 6 show the difference in the QOL scores between male and female nursing students. Although in general, female nursing students obtained higher scores than the males in all four domains, there were no significant differences among their scores. Specifically, physical health obtained a p-value of 0.26, whereas the psychological domain acquired a p-value of 0.46. In addition, the social and environment domains attained a p-value of 0.40 and 0.80, respectively. All these p-values are >0.05 , which means no significant difference.

Discussion

This study was conducted to determine the QOL of nursing students, and to assess if there is a QOL difference between the males and females. The findings corroborate that all nursing students have an average QOL which implies they have functional activities of daily living, enough energy, less pain and discomfort, good capacity for work, adequate positive feelings about the future, balance, and good personal relationships. However, female nursing students have a higher QOL than males specifically in physical and psychosocial health, and social domains, but not in the area of environment, where they scored equally to the men. Moreover, it is noteworthy that differences in scores in the four domains were not significant.

The finding of this study about the average level of the QOL of nursing students is

supported by the study conducted by Moura and co-researchers [6], wherein they found that the overall QOL score in their study among undergraduate nursing students in Brazil obtained an average score. Moreover, they also established that the social domain acquired the highest score among their students. In addition, Yildirim and colleagues [7] also established that the nursing students in their study acquired an average level of QOL in the four domains. On the other hand, another study in Brazil claimed that their students acquired an unfavorable score in the health domain with only 34.6% [6], which is quite similar to the findings of this study.

Further, this study asserts the results of an investigation conducted by Zahran and colleagues [8], which revealed that gender has a strong association with health-related quality of life. However, this study contradicts their findings in that female students reported more physically and mentally unhealthy days than other students. Also, this study diverges from previous studies that showed male students reflect a more stable quality of life in the psychological domain [9,10]. On the other hand, both male and female nursing students acquired the same level of quality of life in the environment domain, which was average. This posits that these students have almost the same environment which covers financial resources, safety and security, home, participation in leisure activities, and transportation.

It is remarkable that both male and female nursing students acquired the lowest

score in the physical health domain, with men attaining below average ratings. It may be related to the bulk of work an individual has to address, because it influences all aspects of life including physical, psychological, mental, and social human [11]. Extreme levels of workload have been associated with workplace conflicts, physical and psychological burnout, stress, exhaustion, [12] sleep problems, and compromised physical health [11, 13] which decreases the quality of life [12]. Further, it is well known that quality of life of students is compromised by a variety of factors. Aside from personal stressors, academic stressors can provoke feelings of fear, incompetence, uselessness, anger, and guilt which can lead to both psychological and physical morbidity [14-16].

The findings about the average range of the QOL of nursing students implies that some of them may be discouraged not to pursue their nursing career in the future because of the negative connotation that they will acquire a poor to average level of QOL in the actual practice. In addition, this could also limit the number of students who will graduate on time because this would also affect their performance in school due to the possibility of having a low to average range of QOL. Therefore, it is imperative for nursing educators and administrators to help their nursing students in improving the level of their QOL.

This study has certain limitations. First, the study was conducted in one com-

prehensive state university; thus, limiting the representativeness of the survey results. Second, students conveyed their responses using a questionnaire, which limits the depth of their answers. As a result, a caution must be exerted in the generalize ability of the results. A large scale multi-regional investigation is needed for further verification of the findings.

Conclusion

This present study shows a relatively good social dimension in the QOL of nursing students in this university. The analysis of the four domains of QOL among nursing students resulted in average scores. Specifically, female students, in comparison with their male counterparts, had acquired higher scores in the physical, psychological, and social domains but not in the environment wherein they were equal. Although women achieved higher QOL scores than men, the differences were not significant. However, due to the limitations of the study, these findings must be treated with some caution.

These findings suggest that administrators and faculty members should consider the different dimensions of QOL among nursing students. Educators should provide students with various opportunities to nurture their skills, while considering QOL in planning extracurricular and academic requirements. Moreover, the amount of the given academic requirements must not exhaust nursing students because these can lead to lack of sleep and stress. Thus, current programs related to this should be developed, such as student

counseling services and involvement in various curricular and extracurricular activities, to further promote QOL among nursing students.

KEYPOINT BOX:

- Our findings found out that nursing students enrolled in our university have an average level of quality of life.
- Female nursing students have a higher quality of life than males particularly in the physical health, psychological, and social domains. However, both male and female nursing students have the same level of quality of life in the environment domain.
- There is no significant difference in the four domains of quality of life between male and female nursing students.

References

1. King CR, Hinds PS. Quality of life from nursing and patient perspectives, 3rd ed. 2012. Burlington, MA: Jones & Bartlett Learning, LLC.
2. Omar DB. Assessing residents' quality of life in Malaysian new towns. *Asian Social Science* 2009;5(6):94-102.
3. Rodriguez ML, Medina CL, Fuentes L, Torres A, Bernal G. Depression symptoms and stressful life events among college students in Puerto Rico. *J Affect Disord* 2013;145(3):323-330.
4. Pozderac Z. Cardiovascular syncope in the University of Sarajevo students. *Journal of Society for Development in New Net Environment in B&H* 2012;6,12:4272-4283.
5. Chu Y, Xu M, Li X. Psychometric properties to measure nursing students' quality of life. *Nurse Ed Today* 2015; 35:e1-e5
6. Moura I, Nobre R, Cortez R, Campelo V, Macedo S, Silva A. Quality of life of undergraduate nursing students. *Rev Gaúcha Enferm.* 2016;37(2):e55291. Doi: <http://dx.doi.org/10.1590/1983-1447.2016.02.55291>
7. Yildirim Y, Kilic S, Akyol A. Relationship between life satisfaction and quality of life in Turkish nursing school students. *Nursing and Health Sciences* 2013;15:415-422.
8. Zahran HS, Zack MM, Vernon-Smiley ME, Hertz MF. Health-related quality of life and behaviors risky to health among adults aged 18-24 years in secondary or higher education – United States, 2003–2005. *Journal of Adolescent Health* 2008;41:389-397.
9. Morishita S, Kaida K, Ikegame K, Yoshihara S, Taniguchi K, Okada M, et al. Impaired physiological function and health related QOL in patients before hematopoietic stem-cell transplantation. *Support Care Cancer* 2012;20:821. Doi:10.1007/s00520-011-1156-2
10. Rahmawati A, Chishaki A, Sawatari H,

- Makaya M, Ohtsuka Y, Nakai M, et al. Gender disparities in quality of life and psychological disturbance in patients with implantable cardioverter-defibrillators. *Circulation Journal* 2013;77:1158-1165.
11. Mintz-Binder RD, Sanders DL. (2012). Workload demand: a significant factor in the overall well-being of directors of associate degree nursing programs. *Teaching and Learning in Nursing* 2012;7:10-16. doi:10.1016/j.teln.2011.07.001.
12. Oliveira Dos Santos Mde, de Oliveira HJ. Influence of work-related variables on quality of life of Anesthesiologists in the City of João Pessoa. *Revista Brasileira de Anestesiologia* 2011;61(3):333-343. doi: 10.1016/S0034-7094(11)70039-3.
13. Holden RJ, Patel NR, Scanlon MC, Shalaby TM, Arnold JM, Karsh BT. Effects of mental demands during dispensing on perceived medication safety and employee well-being: a study of workload in pediatric hospital pharmacies. *Administrative Pharmacy* 2010;6:293-306. doi:10.1016/j.sapharm.2009.10.001.
14. Moffat KJ, McConnachie A, Ross S, Morrison JM. First-year medical student stress and coping in a problem-based learning medical curriculum. *Medical Education* 2004;38:482-491.
15. Guthrie EA., Black D, Shaw CM, Hamilton J, Creed FH, Tomenson B. Embarking upon a medical career: Psychological morbidity in first-year medical students. *Medical Education* 1995;29:337-341.
16. Tyssen R, Vaglum P, Gronvold NT, Ekeberg O. Factors in medical school that predict postgraduate mental health problems in need of treatment: a nationwide and longitudinal study. *Medical Education* 2001;35:110-120.

Original Article

Prevalence of Metabolic syndrome among school children in Majmaah city, Kingdom of Saudi Arabia

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Abstract:

Background: Metabolic Syndrome (Met S) is a collection of concurring risk factors associated with cardiovascular conditions mainly insulin resistance, dyslipidemia, obesity and hypertension. The current study was designed to observe the prevalence of Met S in school going children and assess the association between various components of Met S. **Materials and Method:** This analytical cross-sectional study was conducted on 72 school children who visited the outpatient department at King Khaled University Hospital from March 2016 to February 2017. Blood samples were collected from the participant enrolled in the study for hematological assay. Anthropometric study was done by calculating the Body Mass Index (BMI) and Waist Circumference (WC). Biochemical parameters such as glycemia, total cholesterol, LDLc, HDLc, and triglycerides were estimated to recognize the existence of Met S. The National Cholesterol Education Program (NCEP) consensus was used for defining Met S in children and adolescent. **Results:** Our results showed the

المخلص

الخلفية: متلازمة التمثيل الغذائي هي مجموعة من عوامل الخطر التآزرية القلبية الوعائية التي تتكون من مقاومة الانسولين، اضطراب شحوم الدم، السمنة، وارتفاع ضغط الدم. الهدف من هذه الدراسة هو العثور على انتشار متلازمة التمثيل الغذائي في الأطفال الذين يذهبون إلى المدرسة وتقييم العلاقة بين المكونات المختلفة لها.

المواد والطريقة: أجريت دراسة تحليلية مقطعية على 72 من أطفال المدارس الذين زاروا قسم العيادات الخارجية في مستشفى الملك خالد الجامعي في الفترة من مارس 2016 إلى فبراير 2017. كما تم تقييم الشخصية الدموية لكل مشارك في الدراسة. تم تقييم الأنثروبومترية (مؤشر كتلة الجسم ومحيط الخصر) والمؤشرات البيوكيميائية (جليسميا، الكوليسترول الكلي، الدهون منخفضة الكثافة - الدهون عالية الكثافة والدهون الثلاثية) لتحديد وجود متلازمة التمثيل الغذائي.

تم تعريف متلازمة التمثيل الغذائي وفقا لبرنامج تعليم الكوليسترول الوطني في الأطفال والمراهقين.

النتائج: أظهرت نتائجنا انتشار المتلازمة في 16,7% من الأطفال. محيط الخصر والدهون منخفضة الكثافة كانت من أبرز عوامل الخطر لمتلازمة التمثيل الغذائي بينما يبدو ضغط الدم الانبساطي أقل عامل خطر بارز. كان تركيز السكر في الدم عند الصيام أعلى بكثير عند مقارنة تراكيزه في حالات التمثيل الغذائي وغير متلازمة الأيض. وقد لوحظ وجود ارتباط معنوي بين مستويات الصيام في الدم ومستويات الدهون الثلاثية عند مقارنتها بين حالات الذكور والإناث من مرضي متلازمة التمثيل الغذائي.

الخلاصة: إن الانتشار المرتفع لمتلازمة التمثيل الغذائي

prevalence of Met S in 16.7% of the children. Waist circumference and LDLc were the most prominent risk factors for Met S and Diastolic blood pressure appeared to be the least prominent risk factor. Fasting blood sugar (FBS) was significantly higher on the comparison between metabolic and non-metabolic syndrome cases. A significant association was observed between fasting blood glucose (FBS) and Triglyceride levels when compared among males and females' cases of Met S. **Conclusion:** The high prevalence of Met S in children is a worrying panorama and a multifaceted approach concerning parents, educators, health professionals and this problem should be addressed more essentially through the media. We suggest more studies focusing on identification, intervention and prevention programs to reduce the risk factors of this syndrome in childhood and to reduce future diabetes and cardiovascular disease. Previous studies present with inconsistent findings in terms of both prevalence of Met S and using different criteria for defining Met S that needs formulating a universal definition of the metabolic syndrome for children.

Keywords: Metabolic syndrome (Met S), obesity, prevalence, school children

لدى الأطفال من السيناريوهات المقلقة وذات نهج متعدد التخصصات يشمل الآباء والمعلمين. هناك حاجة إلى المهنيين الصحيين ووسائل الإعلام لمعالجة هذه المشكلة. نقترح المزيد من الدراسات التي تركز على التحديد، التدخل وبرامج وقائية للحد من عوامل الخطر من هذه المتلازمة في مرحلة الطفولة والحد من مرض السكري وأمراض القلب والأوعية الدموية في المستقبل.

الاختلافات في معايير الانتشار وعدم الاتساق لمتلازمة التمثيل الغذائي للأطفال تشير للحاجة إلى تعريف عالمي لها.

Background Introduction:

The prevalence of overweight and obesity is becoming a global threat both among elderly and children. Overweight prevalence tripled in U.S. among children and teenagers in the past 2 decades¹. As per the recent evaluations,

17.1% of children under age 2-19-years are overweight¹. Data from Kingdom of Saudi Arabia (KSA) and other countries in the region shows the prevalence of Met S is 18-40% which solely depends on criteria of defining Met S, the population group studied and other sociodemographic profiles.²⁻⁵ There has been

continuing increase in prevalence of obesity and which is expected to rise further due to economic and social transformations in Saudi Arabia that leads to sedentary lifestyle.⁶ The critical consequences of this tendency holds huge impact on morbidity, mortality and health services expenditure.

Metabolic Syndrome (Met S) is a multisystem disorder characterized by a cluster of metabolic abnormalities that increases the risk of developing cardiovascular and diabetes diseases⁷. These abnormalities include Diabetes, Hypertension, Obesity and Dyslipidemia (elevated triglyceride, low high-density lipoprotein (HDL-C), raised low-density lipoprotein cholesterol (LDL-C)⁷. Central and abdominal obesity remain the cardinal clinical feature of this syndrome⁸. The specific mechanism and pathophysiology of Met S is not fully understood. Several groups have suggested different criteria for diagnosing this condition^{9,10}. Contributing factors to developing this condition include weight gain, aging, inheritance, endocrine maladies like polycystic ovary syndrome in females in reproductive age and with sedentary lifestyle.¹² Changes in blood lipids associated with Met S are raised Triglycerides, high LDL, and a reduced HDL¹¹. It has been estimated that a quarter of the world's population is affected by Met S¹¹. In western countries, the major cause of deaths seems to be cardiovascular disorders.¹²

Despite of rising metabolic syndrome prevalence rate, there is no consistent criteria avail-

able for diagnosing the metabolic syndrome in pediatric age group in terms of components and cutoff points. In children and adolescents, the cutoff points for the metabolic syndrome is based on percentiles and adjusted values adolescents^{13,14}. There is lot of lacunae in literature worldwide in terms of metabolic syndrome prevalence in this group of children. Among Arab populations, metabolic syndrome has not been extensively studied, but the available data suggest that it is an increasingly common problem.¹ One of the possible reason for variation in prevalence could be the different age groups and definitions used in the study.

This study was primarily designed to estimate the prevalence of metabolic syndrome using the definition suggested by the National Cholesterol Education Program (NCEP) III among school children attending outpatient department in King Khaled Hospital, Majmaah, Saudi Arabia.

METHODS

Ethical Principles:

Ethics committee approval was provided by the Majmaah University scientific committee. After getting a written informed consent from parents/guardians of all respondents, the self-designed questionnaire was completed. Additionally, all children gave their verbal consent.

Group of children

We have included in this study, 72 children

[42% female (n = 30) and 58% male (n= 42)], aged 6–13 years, visiting Outpatient Department of King Khaled Hospital. This was based on a cross-sectional study, with quantitative variables. To be included in the study, children should have parental consent. As a preliminary analysis showed that the gender was not a determining factor in the studied variables, we performed the study with male and female in the same sample.

Anthropometric parameters

Waist circumference (WC) was performed from the midpoint between the lateral iliac crest and the lowest rib using a flexible tape and it was evaluated according to percentile data.^{15,16} All the measurements were taken by the same individual to reduce any subjective error.

Biochemical parameters

Blood was collected for the evaluation of the biochemical variables such as glycemia and lipid profile [total cholesterol (TC), triglycerides (TG), high-density lipoprotein (HDL), and low-density lipoprotein (LDL)]. Qualified professionals managed the collection of the blood.

Criteria for diagnosing Metabolic syndrome

NCEP III approach¹⁰ was utilized for valid cross-study comparisons. Subjects who possessed 3 or more characteristics of metabolic syndrome components were considered as having Met S: 1) central obesity (waist cir-

cumference \geq 90th percentile as per the cut-offs recognized by Li et al¹⁷ and modified version by Cook et al¹⁸ for children and adolescent; 2) raised blood pressure (\geq 90th percentile, systolic and/or diastolic); 3) low HDL-C (high-density-lipoprotein-cholesterol) level (\leq 1.03 mmol/L); 4) elevated serum triglycerides (TGs; \geq 1.24 mmol/L); and 5) elevated FBS (\geq 6.1 mmol/L)¹⁰

Subjects were selected in the study based on some exclusion criteria like: 1) children with known medical illness; 2) children receiving any cholesterol lowering or sugar reducing medication; and 3) children who were not fasting.

Statistical methods

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) 20.0 and MS Excel. Data was represented as Mean \pm standard deviation for quantitative variables and as percentage for qualitative variables. Comparison within the group was performed using two independent Student's t-test. The fisher exact test was also applied to observe the association between qualitative variable. Result was found to be statistically significant when the corresponding P-value was \leq 0.05.

RESULTS

No significant difference was observed between baseline characteristics and gender ($p>$ 0.05) respectively (Table 1). As per the classification of NCEP III for metabolic syn-

drome, the cases with 3 or more components were classified as Met S. It was observed that 10 cases presented with 3 components of metabolic syndrome while 2 cases presented with 4 components. Based on this, Met S was prevalent in 12 (16.7%) cases (Table 2).

Waist circumference and LDL were the most prominent risk factors for Met S (67%) respectively, followed by FBS and cholesterol (50%) and Diastolic blood pressure (17%) appeared to be least prominent risk factor (Figure 1). A significant difference was observed between fasting blood sugar (FBS) when compared among the metabolic and non-metabolic syndrome cases ($p < 0.05$), showing that FBS was significantly raised in Met S cases. Table 3 shows that the other parameters were not statistically significant with $p > 0.05$.

Figure 2 shows that there was one component of Met S more prevalent in females ($n = 12$) as compared to males ($n = 6$). Moreover, 2 females and 6 males presented with 2 components of Met S. In addition, more female ($n = 6$) presented with 3 components as compared to males ($n = 4$). Furthermore, 4 components were presented in only 2 males. A significant association was observed between fasting blood glucose (FBS) and Triglyceride levels when compared among males and females' cases of Met S. Result showed that FBS and TG were significantly raised in females' cases ($p < 0.05$) respectively. Whereas, WC, HDL, DBP and Met. S appeared nonsignificant between males and females ($p > 0.05$)

respectively.

DISCUSSION

This is a unique study describing the prevalence of the Met S among adolescents in Majmaah region, Kingdom of Saudi Arabia. This study, carried out in 6–13-year age group of school children, presented the Met S as a widespread challenge in this community. In the current study, the NCEP III consensus definition was used for the diagnosis of Met S in children and adolescent. Our results show that almost fifth of the children studied in this work presented Met S. Brufani et al studied the presence of Met S in Italian children and found a prevalence of 12%.¹⁹ Similar results were obtained in Brazilian schoolchildren (6-10 years) where the prevalence of Met S was found to be 10.2%.²⁰ Previous study presents with limited data regarding Met S among children or adolescents group in KSA. Another cross-sectional study for the prevalence of Met S was conducted by Al-Daghri³ on large sample of 1,231 healthy children aged 10–18-year-olds using NCEP III definition. This study documented the Met S prevalence rate of Met S as 9.4% which is quite similar to the present study which considered the identical age group and definition³.

The waist circumference was the main altered component of Met S and hyperglycemia was the component with the least frequency.²¹ In contrast to this, in our study, we found that waist circumference and LDL-c was the most prominent altered component and the least prominent component was diastolic blood

pressure (DBP).

Another study¹⁶ evaluated the prevalence of Met S and its components in children aged 5–9 years in Colombia (using the criteria for the definition of Met S for adolescents) and studied the relationship with overweight and socio-demographic determinants. These authors found a prevalence of Met S of 8.7% and associated overweight with Met S, while HDL-c, triglycerides, and glucose levels were not significantly associated with this syndrome.¹⁶ Our study showed that all another component except fasting blood sugar was significantly associated with Met S.

Prevalence of Met S ranging from 0.3% to 11.0% was found in another study²² comprising of 675 children and 1247 adolescents from public schools in Bogota. The main prevalent components were altered levels of HDL-c, triglyceride levels, and the least prevalent were altered glycemia and waist circumference.²²

In this study, the main concern is focused on high levels of fasting blood sugar (glycemia). Insulin resistance and type 2 diabetes is a critical growing health problem in adolescents and adults. Increased glycemia is associated with inflammatory processes due to the production of advanced glycation end products that may lead to the release of Tumor Necrosis Factor α , Interleukin-6, and may lead to activation of macrophages and to oxidative stress that is associated with cardiovascular events.^{23,24}

Many studies have been conducted in the past

depicting relationship between the occurrence of Met S in childhood and its perseverance into adulthood. A longitudinal study for tracking Met S from childhood to adulthood was done on 174 Swedish and 460 Estonian children²⁵ that included 9 years old children at the beginning and later followed them for 6 years²⁵.

Extensive studies have been carried out regarding the prevalence^{26,27} and the risk factors associated with Met S²⁸⁻²⁹ in adults, however less importance was given to the same in children and adolescent mainly due to lack of clear definition for Met S in this group of age. It is unfortunate to find that the risk factors associated with Met S in pediatric and adolescent population is not trailing far behind. Obesity may be a reason for this as this is major risk for all age group at any stage of their life

Conclusion:

The result of the current study depict a high prevalence rate of metabolic syndrome in school children (16.7%) with further increasing alarming scenario as they grow up. At this juncture, we should start our study directed towards identification, intervention and prevention programs so as to alleviate the risk factors of this syndrome in the early stage of childhood. Also, it is indispensable at this moment to establish an appropriate definition of metabolic syndrome for children below age 15 years.

Limitations of the study:

A potential limitation which may affect the generalization of the findings is that the study was conducted in a single center. Small sample size was another limitation although the

study was conducted for a period of one year as it was very difficult to get the consent from the parents for the blood sample.

Conflict of interests

Authors declare no conflict of interest.

Table 1. Baseline Characteristics of the Study Subjects by Sex

Parameters	Male (n =42) Mean±SD	Female (n = 30) Mean±SD	P value
Age (years)	9.0±2.21	9.53±1.89	0.442
Weight (kg)	30.89±9.77	32.80±15.84	0.682
Height (cm)	132.19±13.42	130.20±15.24	0.688
BMI (kg/m ²)	17.31±3.41	19.19±9.56	0.476
WC (cm)	60.76±13.73	61.47±14.76	0.885
FBS (mmol/L)	4.87±0.67	5.12±0.97	0.401
HDL-C (mmol/L)	1.33±0.36	1.36±0.31	0.790
TG (mmol/L)	1.11±0.43	1.33±0.54	0.207
SBP (mm Hg)	108.76±5.79	112.80±8.57	0.127
DBP (mm Hg)	64.0±6.81	66.93±13.92	0.460

Abbreviations: BMI, body mass index; WC, Waist circumference; FBS, Fasting blood sugar; HDL-C, high-density-lipoprotein-cholesterol; TG, triglyceride; SBP, systolic blood pressure; DBP, diastolic blood pressure.

Table 2: Classification of Met S based on NCEP III criteria

Met S Component	No. of Male	No. of Female	Total
0	24	10	34
1	6	12	18
2	6	2	8
3	4	6	10
4	2	0	2

Table 3: Metabolic parameters of the children according to the presence of Metabolic Syndrome.

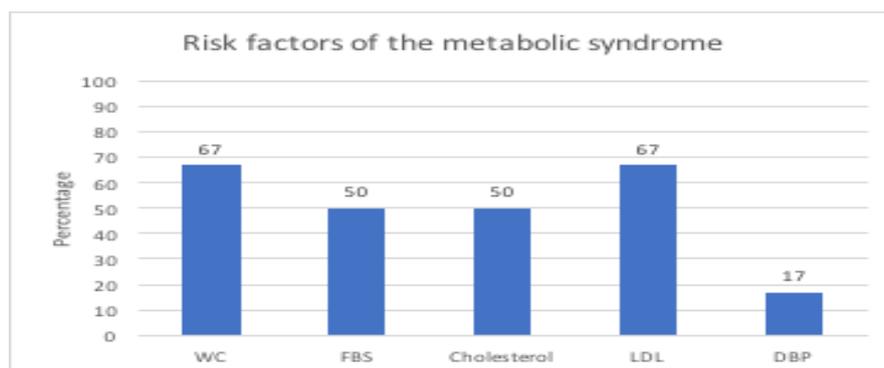
Parameter	Metabolic Syndrome (16.7%)	Non-Metabolic syndrome (83.3%)
FBS	5.20±0.31*	4.93±0.15
TG	1.39±0.25	1.16±0.08
Total cholesterol	163.05±13.55	171.44±5.02
HDL	1.41±0.16	1.33±0.06
WC	63.50±8.39	60.57±2.32
SBP	115.83±2.71	109.37±1.27
DBP	72.33± 8.57	63.80±1.15

* indicate a significant difference at a level of 5%. Abbreviations: BMI, body mass index; WC, Waist circumference; FBS, Fasting blood sugar; HDL-C, high-density-lipoprotein-cholesterol; TG, triglyceride; SBP, systolic blood pressure; DBP, diastolic blood pressure.

Table 4: NCEP III criteria for metabolic syndrome among the studied school children (n = 36)

Parameter	Male		Female		Total		P value
	n	%	n	%	n	%	
WC	6	14.3	2	6.7	8	11.1	0.764
FBS (≥ 110 mg/dL)	4	9.5	12	40	16	22.2	0.021*
HDL (≤ 1.03 mmol/L)	4	9.5	6	20	10	13.9	0.825
TG (≥ 1.7 mmol/L)	4	9.5	8	26.7	12	16.7	0.003*
DBP (≥ 85 mmHg)	0	0.0	2	6.7	2	2.8	0.917
Metabolic syndrome	6	14.3	6	20	12	16.7	0.442

* denotes the level of significance as $p < 0.05$. Abbreviations: BMI, body mass index; WC, Waist circumference; FBS, Fasting blood sugar; HDL-C, high-density-lipoprotein-cholesterol; TG, triglyceride; SBP, systolic blood pressure; DBP, diastolic blood pressure.

**Figure 1: Clustering of risk factors for the Metabolic syndrome.** Abbreviations: Waist circumference; FBS, Fasting blood sugar; LDL, low-density lipoprotein; DBP, diastolic blood pressure.

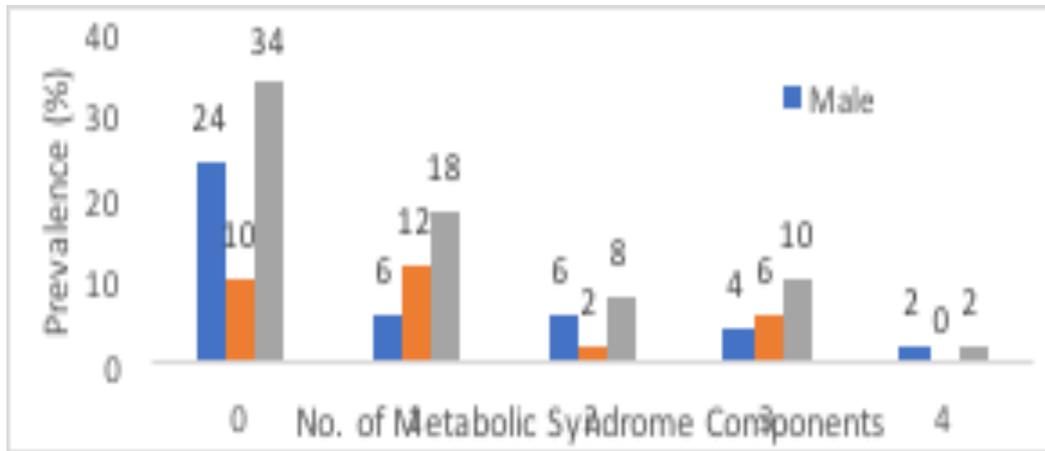


Figure 2: Subjects grouped in male and female according to the number of components of the metabolic syndrome they present with.

References :

- Ogden CL, Carroll MD, Curtin LR, McDowell MA, Tabak CJ, Flegal KM. Prevalence of overweight and obesity in the United States, 1999-2004. *JAMA*. 2006; 295:1549-55.
- Alzahrani A, Karawagh A, Alshahrani F, Naser T, Ahmed A, Emad H. Prevalence and predictors of metabolic syndrome among healthy Saudi adults. *Br J Diabet-Vasc Dis*. 2012; 12:78.
- Al-Daghri NM. Extremely high prevalence of metabolic syndrome manifestations among Arab youth: A call for early intervention. *Eur J Clin Invest*. 2010; 40:1063-6.
- Khader Y, Bateiha A, El-Khateeb M, Al-Shaikh A, Ajlouni K. High prevalence of the metabolic syndrome among Northern Jordanians. *J Diabetes Complications*. 2007; 21:214-9.
- Malik M, Razig SA. The prevalence of the metabolic syndrome among the multiethnic population of the United Arab Emirates: A report of a national survey. *MetabSyndrRelatDisord*. 2008; 6:177-86.
- Naji J. Aljohani. Metabolic syndrome: Risk factors among adults in Kingdom of Saudi Arabia. *J Family Community Med*. 2014; 21(3): 170-175.
- Blaaha M, Elasy TA. Clinical use of Metabolic Syndrome; why the confusion. *Clinical Diabetes*. 2006; 24: 125-131
- Saito T, Shimazaki Y, Kiyohara Y, Kato I, Kubo M, Iida M, Koga T. The Severity of Periodontal Disease is associated with the Development of Glucose Intolerance in Non-diabetics: The Hisayama Study. *Journal of Dental Research* 2004; 83: 485-490.
- Alberti KG, Zimmet PZ. Definition, diagnosis, and classification of diabetes mellitus and its complications. Part 1: diagnosis and classification of diabetes mellitus provisional report of a WHO consultation. *Diabet Med* 1998; 15: 539-553.
- NCEP Executive Summary of the Third Report of The National Cholesterol Education Program (NCEP) Expert Panel on

- Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). *JAMA* 2001; 285: 2486-2497.
10. Cameron A.J., Shaw J.F. and Zimmet P.Z. The metabolic prevalence in the worldwide population. *Endocrinol Metab Clin North Am* 2004; 33: 351-375.
 11. WHO (2005) The World Health Organization warns of the rising threat of heart disease and stroke as overweight and obesity rapidly increase. World Health Organization. <http://www.who.int/mediacenter/news/releases/2005/pr44/en/index.html>.
 12. Ferreira AP, Oliveira CE, França NM. Metabolic syndrome and risk factors for cardiovascular disease in obese children: the relationship with insulin resistance (HOMA-IR). *J Pediatr (Rio J)*. 2007; 83:21-6.
 13. Cook S, Auinger P, Li C, Ford ES. Metabolic syndrome rates in united states adolescents, from the national health and nutrition examination survey, 1999-2002. *J Pediatr* 2008; 152: 165-170.
 14. McCarthy HD, Jarrett KV, Crawley HF. The development of waist circumference percentiles in British children aged 5.0-16.9 y. *Eur J Clin Nutr* 2001; 55: 902-7.
 15. Suarez-Ortegón MF, Aguilar-de Plata C. Prevalence of metabolic syndrome in children aged 5-9 years from southwest Colombia: a cross-sectional study. *World J Pediatr* 2016; 12: 477-83.
 16. Li C, Ford ES, Mokdad AH, Cook S. Recent trends in waist circumference and waist-height ratio among US children and adolescents. *Pediatrics* 2006; 118: e1390-1398.
 17. Cook S, Weitzman M, Auinger P, Nguyen M, Dietz WH. Prevalence of a metabolic syndrome phenotype in adolescents: Findings from the third National Health and Nutrition Examination Survey, 1988-1994. *Arch Pediatr Adolesc Med*. 2003; 157:821-7.
 18. Brufani C, Fintini D, Giordano U, Tozzi AE, Barbetti F, Cappa M. Metabolic syndrome in Italian obese children and adolescents: stronger association with central fat depot than with insulin sensitivity and birth weight. *Int J Hypertens* 2011; 2011:257168.
 19. Rosini N, Moura SA, Rosini RD, Machado MJ, Silva EL. Metabolic Syndrome and Importance of Associated Variables in Children and Adolescents in Guabiruba-SC, Brazil. *Arq Bras Cardiol* 2015; 105: 37-44.
 20. Rinaldi AE, Gabriel GF, Moreto F, Corrente JE, McLellan KC, Burini RC. Dietary factors associated with metabolic syndrome and its components in overweight and obese Brazilian schoolchildren: a cross-sectional study. *Diabetol Metab Syndr* 2016; 8:58.
 21. Ramírez-Vélez R, Anzola A, Martínez-Torres J, Vivas A, Tordecilla-Sanders A, Prieto-Benavides D, et al. Metabolic syndrome and associated factors in a population-based sample of schoolchildren in Colombia: the FUPRECOL study. *Metab Syndr Relat Disord* 2016; 14: 455-62.
 22. Saito R, Araki S, Yamamoto Y, Kusuhara K. Elevated endogenous secretory receptor for advanced glycation end products (esRAGE) levels are associated with circulating soluble RAGE levels in diabetic children. *J Pediatr Endocrinol Metab*. 30: 63-69

23. Nowotny K, Jung T, Höhn A, Weber D, Grune T. Advanced glycation end products and oxidative stress in type 2 diabetes mellitus. *Biomolecules* 2015;165(1):194–222.
24. Martinez-Vizcaino V, Ortega FB, Solera-Martinez M, Ruiz JR, Labayen I, Eensoo, D, Harro J, Loit HM, Veidebaum T, Sjostrom M. Stability of the factorial structure of metabolic syndrome from childhood to adolescence: A 6-year follow-up study. *Cardiovasc Diabetol* 2011; 10: 81.
25. Azizi F, Salehi P, Etemadi A, Zahedi-Asl S. Prevalence of metabolic syndrome in an urban population: Tehran Lipid and Glucose Study. *Diabetes Res ClinPract.* 2003; 61:29–37.
26. Ford ES, Giles WH, Dietz WH. Prevalence of the metabolic syndrome among US adults: Findings from the third National Health and Nutrition Examination Survey. *JAMA.* 2002; 287:356–9.
27. Esmailzadeh A, Mirmiran P, Azizi F. Whole-grain consumption and the metabolic syndrome: A favorable association in Tehranian adults. *Eur J ClinNutr.* 2005; 59:353–62.
28. Eckel RH, Grundy SM, Zimmet PZ. The metabolic syndrome. *Lancet.* 2005; 365:1415–28.

Original Article

An Assessment of Nutrition Education in Primary Schools and its Effect on Students Dietary Behaviors and Body Mass Index in Saudi Arabia

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Abstract:

Objectives: School-based nutrition education can provide children with the knowledge and skills to improve their dietary attitudes and behaviors. This study aimed to assess nutrition education provided to students by schools and its effects on their dietary behaviors and body weight. **Methods:** A multistage-stratified cross-sectional survey was conducted among elementary schools (N=10) which were randomly selected in 2013, Saudi Arabia. 725 children were recruited in this study. A pre-tested questionnaire was administered and descriptive as well as binary logistic regression analyses were performed to demonstrate the findings. **Results:** Systematic school-based nutrition education program was not provided in all of the visited schools; also, there was no nutrition coordinator available in any of the surveyed schools. Only 55.8%, 11.6% and 17% of the total students stated they have been taught by school about healthy nutrition/diets, healthy methods of gaining weight and losing weight,

المخلص

الأهداف: التثقيف الصحي التغذوي في المدارس يهدف إلى تزويد الأطفال بالمعلومات والمهارات اللازمة لتحسين خياراتهم الغذائية وتعزيز السلوكيات الغذائية الصحية لديهم، لذا هدفت هذه الدراسة أولاً إلى تقييم دور المدارس فيما يتعلق بالتثقيف التغذوي، وكذلك علاقة التثقيف التغذوي المدرسي من وجهة نظر الطلاب بعاداتهم الغذائية.

طرق البحث: تم إجراء هذه الدراسة الوصفية المقطعية عام ٢٠١٣، وتم اختيار عينة الدراسة عن طريق العينة الطبقيّة متعددة المراحل. وعلية فقد شملت هذه الدراسة ٧٢٥ من أطفال المدارس من ١٠ مدارس ابتدائية في الباحة للإجابة على الاستبيان وجمع المعلومات المطلوبة. تم استخدام منهج التحليل الوصفي لإظهار النتائج والانحدار اللوجستي لاختبار علاقة دور المدرسة في التثقيف التغذوي مع سلوكيات الاطفال التغذوية.

النتائج: وجدت الدراسة بأنه لا تتوفر برامج محددة ومتخصصة حول التغذية الصحية في جميع المدارس التي شملتها الدراسة، وكذلك لا يوجد منسق مسؤول (معلم او غيره) مكلف بأمور التغذية في كل هذه المدارس. كما بينت النتائج ان ٥٧,٨٪ فقط ذكروا أنهم تلقوا تعليم عن التغذية الصحية، و١١,٦٪ تلقوا تعليم عن الطرق الصحية السليمة لزيادة الوزن، و١٧٪ حول الطرق الصحيحة لفقدان الوزن. كما وجدت الدراسة بأن ٣١٪ من إجمالي الطلاب أفادوا انهم تلقوا دروس تثقيفية حول الموضوعات المتعلقة بسلامة الأغذية، و٢٤,٤٪ من الطلاب تعلموا عن كيفية إعداد الوجبة صحية. وتلخصت مصادر المعلومات الغذائية للطلاب على النحو التالي؛ الأسرة (٦٤٪) وسائل الإعلام (٥٩٪) تليها المدرسة (٥٤٪). وذكرت الغالبية العظمى من الطلاب (٩٦٪) بأنهم بحاجة إلى برامج تعليمية عن التثقيف الصحي الغذائي. وأظهر تحليل الانحدار المعياري بأنه لا يوجد هناك

respectively. Being taught about food safety topics and how to prepare healthy meals were reported by 31% and 24.4% of the students, respectively. Family (64%) and media (59%) were the most sources of nutrition information for children, followed by school and friends. The majority of students (96%) stated they need nutrition education programs in schools. Regression analysis showed that being taught in schools about healthy nutrition was only associated with children age (OR= 1.1, 95% CI: 1.0 – 1.2, $p= 0.039$). No differences were detected between the group who stated being taught about healthy nutrition and who stated not being taught concerning their dietary behaviors and BMI. **Conclusions:** Schools were found to be not functioning efficiently in providing nutrition education for students. There is a great need to establish school-based nutrition education including school nutrition coordinators in Saudi Arabia.

Keywords: Dietary habits; Health education; Nutrition knowledge; Public health, School health.

فروق ذات دلالة إحصائية بين المجموعة التي ذكرت انها تلقت دروس حول التغذية الصحية والمجموعة الأخرى التي ذكرت أنها لم تتلقى أي دروس عن التغذية الصحية من خلال المدرسة فيما يتعلق بسلوكياتهم الغذائية ومؤشر كتلة الجسم.

الاستنتاجات: هناك حاجة ماسة لتحسين دور المدارس فيما يتعلق بالتعليم والتثقيف الصحي التغذوي. كما وهناك حاجة ماسة إلى مجموعة متكاملة من البرامج التغذوية لتعزيز التغذية عند الاطفال وطلاب المدارس في المملكة العربية السعودية.

الكلمات المفتاحية: التثقيف الصحي، التثقيف الغذائي، طلاب المدارس، الصحة المدرسية، الصحة العامة.

Introduction:

Healthy nutrition is a cornerstone for people health and wellbeing. On the other hand, unhealthy nutrition behaviors are core contributors to chronic diseases and health problems (WHO, 2015). Thus, without proper healthy nutrition, achieving a good state of health might be unattainable. However,

there are two major kinds of nutritional problems; those due to inadequate intake of some essential nutrients, and those due to an excessive intake of food or certain type of nutrients (FAO, 2005). Healthy diet helps protect against malnutrition in all its forms (WHO, 2015).

Epidemiological and clinical studies have established that diet and nutritional behaviors

play an important role in the etiology of major chronic diseases. For instance, it has been long reported that the risk of cardiovascular diseases can be decreased by healthy eating (WHO, 1990), as well as other non-communicable diseases (NCDs), including diabetes, stroke and cancer (WHO, 2015). Furthermore, it has been reported that fruits and vegetables contain variety of vitamins, minerals, and other compounds that have been inversely associated with (CVDs) risk factors (Miller, 2000; Genkinger, 2004). According to World Health Organization, low fruit and vegetable intake are estimated to cause about 11% of stroke and 31% of ischemic heart disease worldwide (WHO, 2002). Moreover, fruits and vegetables are good sources of fibers, and high intakes of fibers induce weight loss (WHO, 2003). In addition, consuming milk and dairy products daily can be a protective factor because it contains various essential minerals and vitamins. Children who drink milk and dairy products tend to have better overall nutritional status (Ballew et al., 2000; Bowman, 2002).

Health, nutrition, and education are three fundamental pillars for growth and development (WHO, 2005), and they are interconnected. Healthy nutrition may affect intellectual development and learning performance. For instance, it has been reported that children who are hungry or who have poor diet are likely to: suffer from vitamin and mineral deficiencies (e.g. vitamin A, iron, iodine), grow slowly, have little energy to play or do physical work, have short attention

spans and do less well at school (FAO, 2005). Previous studies reported relationship between school children nutritional status as well as dietary behaviors and their cognitive test scores or school performance. It has been reported that inadequate nutrient intake was associated with poor academic behavior and performance (Anzman-Frasca et al., 2015). Moreover, review studies suggested that breakfast consumption might enhance students' cognitive function, memory, test grades and school performance (Rampersaud et al., 2005; Adolphus et al., 2013).

Furthermore, it has been suggested that nutrition education in schools and school teachers are important in providing health education and improving a healthy lifestyle (Shah et al., 2010). Nutrition education has also been effective in creating positive attitudes towards fruits and vegetables among children (Wall et al., 2012; Prelip et al., 2012). Higher nutrition knowledge of the children was significantly associated with higher vegetable intake (Asakura et al., 2017). A whole-school approach toward healthy dietary behaviors can provide children and adolescents with the knowledge and skills and how best to implement them both within and outside the school setting (WHO, 2006). Nutrition education is defined as any educational strategies designed to enhance nutritional knowledge to facilitate voluntary adoption of healthy food choices. Nutrition education is important because it has the potential to prevent diseases and improve individuals' health.

Generally, eating behaviors are established during this period, and as many health related behaviors may persevere throughout adulthood. It has been stated that the progress of children's behaviors relies on actions carried out in school (WHO, 2006). This is widely acknowledged in developed countries and has created several initiatives throughout the European countries. Unfortunately, it can be clearly noticed that school environment and school health services (e.g. nutrition services, school nutrition education, etc) still not receiving the required attention by the education authorities and policy makers in Saudi Arabia as well as other developing countries. In the light of the above, and due to the lack of studies concerning school nutrition education in our region, it was necessary to conduct such study. It is hoped that this study will help to inform policy makers about nutrition education in schools.

Methods:

This cross-sectional study was conducted to assess nutrition education in schools from students' perspective in Al-Baha city, southwestern Saudi Arabia in 2013. The sample was drawn from primary schools using a multi-stage stratified sampling technique. At the first stage, a simple random-sampling procedure was used to select the schools (N= 10). At the second stage, a simple stratified random-sampling design technique was used to recruit students from different grade levels. All students in the selected classes were invited to participate in the study. Finally, 725 schoolchildren, aging from 7 to 12 years old

were recruited in this study.

Students were asked separate questions regarding the role of schools in nutrition education as following: Have you been taught in school about healthy diet/nutrition?; Have you been taught in school about healthy way of gaining weight? Have you been taught in school about the healthy methods of losing weight? Have you been taught in school about food safety? Have you been taught in school how to prepare a healthy meal?. Body mass index (BMI) was calculated using the equation $BMI = (\text{weight [kg]} / \text{height [m]}^2)$. It is worth to mention that the study was first piloted among small sample of schoolchildren (n=32) who were not included in the main study. From the pilot study, it has been found that the children were not aware of their family socioeconomic status such as their parents' education level and family income, which limit the analyses performed in this study.

Data were entered, edited and analyzed using SPSS version 22. Frequencies of all responses were calculated. A binary regression analysis of being taught in schools about healthy nutrition with regard to other nutrition related behaviors were performed. A *p*-value < 0.05 was considered statistically significant in this study. Permission was obtained from the Education Directorate. The data were collected anonymously and the privacy and confidentiality of the data was strictly maintained.

Results:

The total sample included in this study was 725 children and the mean age was 9.8

years, ranged between 7–12 years old (S.D = 1.6). Table 1: shows that 55.8% of the total students stated they have been taught about healthy nutrition/diet. Moreover, only 11.6% and 17% stated they have been taught about the healthy methods to gain or lose weight, respectively. Only 24.4% and 31% reported being taught in schools about the healthy way to prepare healthy meal and about food safety (e.g. how to safely prepare and store food), respectively.

Table 1: Students perception to the schools role with regard to nutrition education

Items		
Taught in school about healthy nutrition/diet		
	No.	%
Yes	419	55.8
No	306	42.2
Total	725	100.0
Taught in school about healthy way of gaining weight		
	No.	%
Yes	84	11.6
No	641	88.4
Total	725	100.0
Taught in school about the healthy methods of losing weight		
	No.	%
Yes	123	17.0
No	602	83.0
Total	725	100.0
Taught in school about essential food safety		
	No.	%
Yes	225	31.0
No	500	69.0
Total	725	100.0
Taught in school how to make healthy meals		
	No.	%
Yes	177	24.4
No	548	75.6
Total	725	100.0

Among the different nutrition information sources, family (64%) and media (59%) were reported as the most sources of nutrition

information among children. Schools came as the third source of nutrition information (54%) followed by friends (24%), (Figure 1). Moreover, out of 725 students participated in this study, 96% stated that they need nutrition education program (Figure 2).

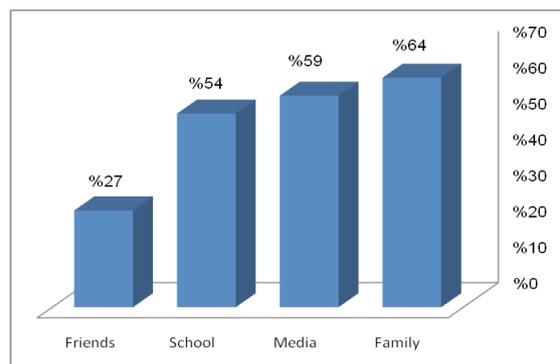


Figure 1: Sources of nutrition information among schoolchildren

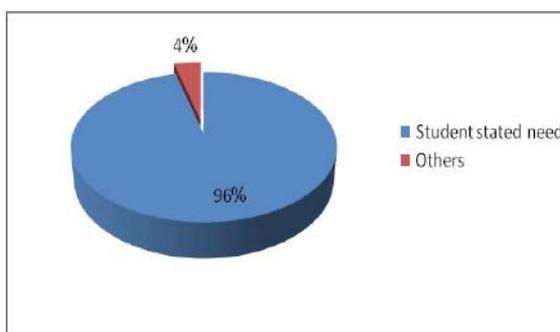


Figure 2: Students self - reported need for nutrition education programme.

Table 2, represents the binary logistic regression analysis of the students perception of being taught from schools about the healthy nutrition with regard to many correlates variables. The analysis showed that being taught in schools about healthy nutrition was associated positively with children age (OR= 1.1, 95% CI: 1.0 – 1.2, $p = 0.039$). On the other hand, there were no differences between the group who stated being taught about healthy nutrition/healthy dietary and

the group who stated not being taught from schools about healthy nutrition with regards to their dietary behaviors of consuming fruit daily (OR= 1.1, 95% CI: 0.7 – 1.6, $p = 0.549$), consuming vegetables daily (OR= 1.0, 95% CI: 0.7 – 1.4, $p = 0.997$), consuming milk and dairy products (OR= 0.9, 95% CI: 0.6 – 1.2, $p = 0.373$), consuming sweets daily (OR= 1.3, 95% CI: 0.9 – 1.9, $p = 0.115$), consuming soft drinks daily (OR= 1.4, 95% CI: 0.9 – 2.2, $p = 0.078$), energy drinks daily (OR= 0.8, 95% CI: 0.4 – 1.7, $p = 0.595$), eating high fat food every day (OR= 1.0, 95% CI: 0.8 – 1.5, $p = 0.877$), consuming fast food regularly (OR= 0.7, 95% CI: 0.5 – 1.1, $p = 0.196$), and students BMI (OR= 1.0, 95% CI: 0.9 – 1.1, $p = 0.868$).

Table 2: Regression analysis of students perception of being taught about healthy eating in schools and student's dietary behaviors and BMI

Variables	OR. [C.I.]	P- value
Age	1.1 [1.0 – 1.2]	0.039
BMI	1.0 [0.9 – 1.1]	0.868
Consuming Fruit	Ref	
Not every day	1.1 [0.7 – 1.6]	0.549
Every day		
Consuming Vegetables	Ref	
Not every day	1.0 [0.7 – 1.4]	0.997
Every day		
Consuming Milk Products	Ref	
Not every day	0.9 [0.6 – 1.2]	0.373
Every day		
Consuming Sweets Products	Ref	
Not every day	1.3 [0.9 – 1.9]	0.115
Every day		
Consuming Soft-Carbonated Drinks	Ref	
Not every day	1.4 [0.9 – 2.2]	0.078
Every day		
Consuming Energy drinks	Ref	
Not every day	0.8 [0.4 – 1.7]	0.595
Every day		
Consuming Fast Foods	Ref	
Not Regularly	0.7 [0.5 – 1.1]	0.196
Regularly		
Consuming High Fat Foods	Ref	
Not every day	1.0 [0.7– 1.5]	0.877
Every day		

Discussion:

This study indicated that school-based nutrition education was not found to be offered in all the visited schools. Also, unlike many countries world-wide, this study revealed that nutrition coordinators were not available in any of the visited schools. About 55.8% of the total students stated they have been taught during their school days about healthy nutrition/diet, and only 24.4% and 31% reported being taught about how to prepare healthy meal and learned about food safety. Also, the majority of the school children (96%) stated that they need school-based health education program regarding healthy diet and nutrition. These results highlight the urgent need for school-based nutrition education program in Saudi Arabia. As a result, school-based nutrition education should be established, enhanced

and promoted, which can lead to improve children dietary behaviors and contribute to health improvement. It has been reported that healthy nutrition behaviors in childhood can improve people well-being, learning ability and leading to better academic performance (WHO, 2006). School-based nutrition education can improve dietary behaviors that affect young people growth, health and intellectual development (CDC, 1996). It has been reported that many children and adolescents grow up without learning the basic skills of how to arrange for a healthy diet (WHO, 2006), which may increase their tendency of eating out, encouraging the consumption of snacks with poor nutrient content, large portions of meals and high calories. Therefore, nutrition program interventions need to occur early in childhood in order to prevent overweight and unhealthy eating behaviors and the adverse health effects (St-Onge et al., 2003), and school-based nutrition education programs must become a national priority (CDC, 1996).

In addition, this study found that the majority of the students were not taught about the healthy methods of gaining or losing weight. Unhealthy losing weight practices have long been reported among children (Mellin, 1988; Maloney et al., 1989). In United States, it has been reported that many young people practice unsafe weight-loss methods (CDC, 1996). The use of dieting and weight control methods among young people has grabbed many public concerns, due to the associated negative physiological and psychological

consequences (WHO, 2006). Therefore, children and adolescents should learn about the danger of harmful/unhealthy weight-loss techniques and about the health ways of maintaining a healthy weight (CDC, 1996). Thus, these findings highlight the need for school-based nutrition education taking into account many related issues such as the healthy methods of maintaining ideal weight, ineffectiveness and unhealthful weight-gain and weight-loss practices among children.

The logistic analysis (Table 2) showed that students perceptions of being taught in schools about healthy nutrition was only associated positively with an increase in children age. This positive association might be attributed to the effect of students' school grades or their cognitive development, experiences and awareness. On the other hand, there were no differences between the group who stated being taught about nutrition/healthy dietary behaviors and the group who stated not being taught concerning their dietary behaviors and students BMI. This might be due to the lack of efficient school-based nutrition education (e.g. scientific, effective, continuous and systematic) and the absence of nutrition coordinators in schools, which this study has revealed. In addition, these findings beg the questions of the effectiveness and the bear equality of nutrition education that those students receive and perceive from schools. Nutrition education in schools and school teachers are important in providing health education and improving a healthy lifestyle (Shah et al., 2010), which in turn

can improve children dietary knowledge and behaviors. Similarly, it has been stated that higher nutrition knowledge was significantly associated with higher vegetable intake among children (Asakura et al., 2017). Family dietary behaviors and social/culture influences can have a great effect upon children dietary knowledge, attitudes and behaviors. Consistent associations were found between parent and children's eating behaviors and children attitudes (Brown and Ogden, 2004). Moreover, children's eating behaviors are strongly influenced by surrounded physical and social environment (Patrick and Nicklas, 2005); including availability and easily accessibility to healthy food and several socioeconomic and sociocultural factors such as parents' background and education have strong influence upon children dietary behaviors.

As this study revealed (Figure 1), family and media were the most common sources of nutrition information among children. Unfortunately, schools were reported came as the third source for nutrition information followed by friends. Similarly, it has been reported elsewhere that the students' knowledge of food and nutrition was insufficient, and most of the nutrition information was obtained through the media (Brook and Tepper, 1997). In line with that, the radio and TV, followed by family/friends were the most sources of nutrition information (Charlton et al., 2004). The finding that the media is popular source of nutrition information amongst children may

have both negative and positive implications. On one hand, media can send important nutrition messages and reach many children and schools easily. Which reaches on the other hand, it has been reported that about half of the nutrition information advertisements in food and beverage was misleading or related to inaccurate (Byrd-Bredbenner and Grasso, 2000). Therefore, policy makers should pay more attention, use the media more effectively to design, and promote healthy nutrition information in order to improve people dietary behaviors. Additionally, it has been suggested that there is a necessity to develop consumer education programs to equip people with the skills needed to evaluate the validity of nutrition information presented via the media (Byrd-Bredbenner and Grasso, 2000).

The overall findings indicate that there is crucial need for more extensive effort. In particular, opportunity exist for development of appropriate school-based nutrition education so the messages received by students are effective, consistent and aimed at motivating children to choose a healthy diet. Schools can offer effective, efficient and better opportunities than any other setting to promote and support healthy eating. It has been reported that school nutrition education serves as a means to advise families and community members about ways to prevent malnutrition and promote health (WHO, 1998). Nutrition education has been shown to have a significant effect in fostering healthful dietary behaviors (Berg, 1993). A significant impact of educative nutrition intervention on

knowledge and behavior were documented (Shah et al., 2010; Fahlman et al., 2008). A whole-school approach toward healthy dietary behaviors can provide children and adolescents with the knowledge and skills and how best to implement them both within and outside the school setting (WHO, 2006).

The challenge in education is not about to get children into school nowadays, but also to improve the overall quality of school environment, school services and address students' needs (Alsubaie and Omer, 2015). Therefore, school environment must be of central interest to policy makers and Ministry of Education in Saudi Arabia. However, there are some evidences that schools in Saudi Arabia suffer and lack of some environment measures (Alsubaie, 2014a; Alsubaie, 2014b). Investments in schools are predicted to yield benefits to individuals, communities and nations as a whole (WHO, 1998).

Some limitations should be highlighted. First, this study was based on questionnaire cross-sectional design, which might be subjected to over reporting or under reporting. Second, according to Saudi culture and education system male and female are separated in schools, consequently it was not allowed for male investigators to access female schools or contact female students. Therefore, female schools and students were not included in this study.

Conclusion:

This study revealed that school-based nutrition education program is lacking, insufficient and ineffective. Therefore, there is a great

need for school-based nutrition education and consistent health education programs to be established in schools to promote healthy nutrition and improve children dietary behaviors.

It is hoped that this study can serve as a reference point for future research in the field of nutrition education in Saudi Arabia. Further and extensive in-depth studies exploring nutrition education in schools and its barriers, correlates and determinants are highly needed.

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Conflict of interest

The researchers declared that they have no competing interest.

Ethical approval statement

The study aims and protocol were explained to schools principals and teachers to allow and encourage students to participate in this study. Moreover, the study aims and questionnaire were explained to students. Schools and students' participation in the study was voluntary. Moreover, there was no intervention given or administered to the participants.

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References:

1. Adolphus K, Lawton CL, Dye L. The effects of breakfast on behavior and academic performance in children and adolescents, *Front Hum Neurosci* 2013; 7: 425.
2. Alsubaie ASR. Indoor Air Ventilation Assessment in Primary Schools in Eastern Province, Saudi Arabia. *International Journal of Current Research*, 2014; 6(5): 6552–6557.
3. Alsubaie ASR. Indoor Noise Pollution in Elementary Schools of Eastern Province, Saudi Arabia. *J Res Environ Sci Toxicol*, 2014b; 3(2): 25–29.
4. Alsubaie ASR, Omer EO. Physical Activity Behavior Predictors, Reasons and Barriers among Male Adolescents in Riyadh, Saudi Arabia: Evidence for Obesogenic Environment. *International journal of health sciences*, 2015; 9(4): 400-408.
5. Anzman-Frasca S, Djang HC, Halmo MM, Dolan PR, Economos CD. Estimating impacts of a breakfast in the classroom program on school outcomes. *Journal of the American Medical Association Pediatrics*, 2015; 169(1): 71-77.
6. Asakura K, Todoriki H, Sasaki S. Relationship between nutrition knowledge and dietary intake among primary school children in Japan: Combined effect of children's and their guardians' knowledge. *Journal of Epidemiology*; 2017. Doi.org/10.1016/j.je.2016.09.014
7. Ballew C, Kuester S, Gillespie C. Beverage choices affect adequacy of children's nutrient intakes. *Arch Pediatr Adolesc Med*, 2000; 15(11): 1148-1152.
8. Berg A. More Resources for Nutrition Education: Strengthening the Case. *Journal of Nutrition Education*, 1993; 25(5): 278-282.
9. Bowman SA. Beverage choices of young females: changes and impact on nutrient intakes. *J Am Diet Assoc*, 2002; 102(9): 1234-1239.
10. Brook U, Tepper I. High school students' attitudes and knowledge of food consumption and body image: implications for school based education. *Patient education and counseling*, 1997; 30(3): 283-288.
11. Brown R, Ogden J. Children's eating attitudes and behaviour: a study of the modelling and control theories of parental influence. *Health Education Research*, 2004; 19(3): 261-271.
12. Byrd-Bredbenner C, Grasso D. What is television trying to make children swallow? Content analysis of the nutrition information in prime-time advertisements. *Journal of Nutrition Education*, 2000; 32(4): 187-195.
13. CDC. MMWR. Guidelines for School Health Programs to Promote Lifelong Healthy Eating. 1996; 45(RR-9); 1-33. Retrieved from: <http://www.cdc.gov/mmwr/preview/mmwrhtml/00042446.htm> (Accessed on: June 2017).
14. Charlton KE, Brewitt P, Bourne LT. Sources and credibility of nutrition information among black urban South African women, with a focus on messages

- related to obesity. *Public Health Nutrition*, 2004; 7(6): 801-811.
15. Fahlman MM, Dake JA, Mccaughtry N, Martin J. A pilot study to examine the effects of a nutrition intervention on nutrition knowledge, behaviors, and efficacy expectations in middle school children. *Journal of School Health*, 2008; 78 (4): 216-222.
 16. FAO. *Nutrition Education in Primary Schools: Vol. 1: The Reader*. Food and Agriculture Organization, Rome, 2005.
 17. Genkinger JM, Platz EA, Hoffman SC, Comstock GW, Helzlsouer KJ. Fruit, vegetable, and antioxidant intake and all-cause, cancer, and cardiovascular disease mortality in a community-dwelling population in Washington County, Maryland. *Am J Epidemiol*, 2004; 160(12): 1223-1233.
 18. Maloney MJ, Mcguire J, Daniels SR, Specker B. Dieting behavior and eating attitudes in children. *Pediatrics* 1989; 84(3): 482- 489.
 19. Mellin LM. Responding to disordered eating in children and adolescents. *Nutr News*, 1988; 51(2): 5-7.
 20. Miller HE, Rigelhof F, Marquart L, Prakash A, Kanter M. Antioxidant content of whole grain breakfast cereals, fruit and vegetables. *J Am Coll Nutr*, 2000; 19(3): 312S-3199S.
 21. Patrick H, Nicklas TA. A review of family and social determinants of children's eating patterns and diet quality. *Journal of the American College of Nutrition*, 2005; 24(2): 83-92.
 22. Perera T, Frei S, Frei B, Wong SS, Bobe G. Improving Nutrition Education in U.S. Elementary Schools: Challenges and Opportunities. *Journal of Education and Practice*, 2015; 6 (30): 41-50.
 23. Prelip M, Kinsler J, Thai C, Erausquin J, Slusser W. Evaluation of a school-based multicomponent nutrition education program to improve young children's fruit and vegetable consumption. *Journal of Nutrition Education and Behavior*, 2012; 44(4):310-318.
 24. Rampersaud GC, Pereira MA, Girard BL, Adams J, Metzlj JD. Breakfast Habits, Nutritional Status, Body Weight, and Academic Performance in Children and Adolescents. *J Am Diet Assoc*, 2005; 105(5): 743-760.
 25. Shah P, Misra A, Gupta N, Hazra DK, Gupta R, Seth P, et al. Improvement in nutrition-related knowledge and behaviour of urban Asian Indian school children: findings from the 'Medical education for children/Adolescents for Realistic prevention of obesity and diabetes and for healthy ageing'(MARG) intervention study. *British Journal of Nutrition*, 2010; 104 (3): 427- 436.
 26. St-Onge M, Keller K, Heymsfield S. Changes in childhood food consumption patterns: a cause for concern in light of increasing body weights. *American Journal of Clinical Nutrition*, 2003; 78(6): 1068–1073.
 27. Wall DE, Least C, Gromis J, Lohse B. Nutrition education intervention improves vegetable-related attitude, self-efficacy, preference, and knowledge of fourth-grade students. *J Sch Health*,

- 2012; 82: 37-43.
28. WHO. Diet, Nutrition, and the Prevention of Chronic Diseases. WHO Technical Report Series No 797. Geneva: WHO, 1990.
 29. WHO. The Status of School Health. Geneva; WHO, 1996. Available at: <http://www.who.int/iris/handle/10665/63364>. (Accessed on: May 2017).
 30. WHO. WHO information series on school health document four. Healthy Nutrition: An Essential Element of a Health- Promoting School. World Health Organization, 1998.
 31. WHO. The World Health Report, Reducing risks, promoting health. Geneva, World Health Organization, 2002.
 32. World Health Organization (Bangkok Charter for Health Promotion in a Globalized World. WHO, Geneva; 2005.
 33. WHO. Food and nutrition policy for schools: A tool for the development of school nutrition programmes in the European Region. Programme for Nutrition and Food Security WHO Regional Office for Europe, Copenhagen 2006.
 34. WHO. Healthy diet. Fact sheet N. 394. World Health Organization 2015. Available at: <http://www.who.int/mediacentre/factsheets/fs394/en/> (Accessed on: June 2017).

Original Article

Incidence Trend of Cutaneous Leishmaniasis (CL) in Majmaah, Kingdom of Saudi Arabia

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Abstract

Background: Leishmaniasis is caused by the flagellate protozoa of the genus *Leishmania* and is transmitted by the bite of female phlebotomine sand flies. Worldwide, an estimated 1.5 million cases of cutaneous Leishmaniasis occur annually. Although the disease showed remarkable decline in the prevalence during 1987 and 1990 in Riyadh region of Saudi Arabia, few studies had addressed the current status of the disease in recent times. The objective of this study was to determine the trends in reported incidence of Cutaneous Leishmaniasis in Majmaah, Saudi Arabia between 2007 and 2016. **Research methods:** The research design was descriptive, institutional-based study of the epidemiological trend of Cutaneous Leishmaniasis infection in Majmaah, Saudi Arabia using data from the surveillance data base at the regional Vector Control Unit, Local Health Directorate; Riyadh, Saudi Arabia. Total enumerations of all records of patients registered and treated in King Khalid hospital, Majmaah during 2007-2016 were included in this study. The data

last five years of the study.

المخلص

خلفية: يتسبب داء الليشمانيا من الحيوانات أحادية الخلايا منجنس الليشمانيا وينتقل عن طريق لدغة ذبابة الرمل من إناث القلب وتأمين. يحدث سنويا ما يقدر بحوالي ١,٥ ملي ونحالة من داء الليشمانيا الجلدي حول العالم. على الرغم من أن المرض أظهر انخفاض ملحوظا في الانتشار بين عامي ١٩٨٧ و ١٩٩٠ في منطقة الرياض بالمملكة العربية السعودية الا أن هنالك دراسات قليلة تناولت المرض في الآونة الأخيرة. الهدف من هذه الدراسة هو تحديد الاتجاهات في حالات الليشمانيا الجلدي التي سجلت في المجموعة بالمملكة العربية السعودية في الفترة ما بين عامي ٢٠٠٧ و ٢٠١٦.

منهج البحث: هذه الدراسة وصفية لتحديد الاتجاه الوبائي لعدوى الليشمانيا الجلدية في المجموعة بالمملكة العربية السعودية باستخدام قاعدة بيانات الرصد المرضي بوحدة مكافحة نواقل الأمراض بمديرية الصحة ، الرياض بالمملكة العربية السعودية. تم جمع البيانات عن طريق قائمة المراجعة من سجلات المرضى الذين تم علاجهم بمستشفى الملك خالد بالمجموعة ,المملكة العربية السعودية خلال ٢٠٠٧-٢٠١٦. تم تحليل البيانات عن طريق برنامج الحزمة الاحصائية (SPSS- 22) للعلوم الاجتماعية.

النتائج: تعتبر الفئة العمرية ١٥ - ٤٤ سنة أكثر الفئات إصابة

were collected by a pre-tested check list and analyzed by SPSS version 22. **Results:** The age group 15-44 was mostly affected by Cutaneous Leishmaniasis (50.6%). Most patients were males (78.2%) and majority of the Saudi nationality (62.1%); farmers were mostly affected by the disease (28.7%) compared to other occupations. The reported incidence of the disease was 33:100000 populations in 2007 and reached its peak as 44:100000 populations in 2008 then started to decline with fluctuations to reach 4:100000 populations in 2016. During the first five years of the study (2007-2011), patients less than 15 years of age were 21(30.9%) while those 15 years of age and more were 47 (69.1%); the male and female patients were 82.4% and 17.6% respectively. During the second half of the study (2012-2016), patients less than 15 years of age were 4(21.1%) while those 15 years of age and more were 47 (69.1%); the male and female patients were 82.4% and 17.6% respectively. **Conclusion:** The findings of this study concluded that the trends of Cutaneous Leishmaniasis in Majmaah, Saudi Arabia declined during the past ten years. The disease was more prevalent among the older age group, the Saudis, and the male gender: However, the incidence of the disease among the females increased significantly during the

بليشمانيا الجلدية (٥٠,٦٪). معظم المرضى من الذكور (٧٨,٢٪) والجنسية السعودية (٦٢,١٪). المزارعون أكثر إصابة بالمرض مقارنة بالوظائف الأخرى. نسبة حدوث الليشمانيا الجلدية المبلغ عنها ٣٣: ١٠٠٠٠٠٠ من السكان في عام ٢٠٠٧، بلغت ذروة المرض ٤٤: ١٠٠٠٠٠٠ من السكان في عام ٢٠٠٨ ثم بدأ المرض في الانخفاض بعد ذلك ليصل المعدل إلى ٤: ١٠٠٠٠٠٠ من السكان في عام ٢٠١٦. خلال سنوات الخمس الأولى من الدراسة (٢٠٠٧ - ٢٠١١)، فإن معدل حدوث المرض للفئة العمرية أقل من ١٥ عاما (٣٠,٩٪)، في حين أن المعدل للفئة العمرية ١٥ سنة فأعلى تمثل (٦٩,١٪). بلغت نسبة المرضى الذكور والإناث ٨٢,٤٪ و ١٧,٦٪ على التوالي. خلال النصف الثاني من الدراسة (٢٠١٢-٢٠١٦) فإن معدل حدوث المرض للفئة العمرية أقل من ١٥ عاما (٢١,١٪)، في حين أن المعدل للفئة العمرية ١٥ سنة فأعلى تمثل (٦٩,١٪). بلغت نسبة المرضى الذكور والإناث ٨٢,٤٪ و ١٧,٦٪ على التوالي.

المستخلص: أن اتجاهات حدوث داء الليشمانيا الجلدية في المملكة العربية السعودية انخفضت خلال السنوات العشر الماضية. المرض أكثر انتشارا بين الفئة العمرية الأكبر سنا والسعوديين والذكور إلا أن الإصابة بالمرض بين الإناث زادت بشكل ملحوظ خلال السنوات الخمس الأخيرة من الدراسة

Introduction

Leishmaniasis remains a major public health problem; with an estimated global burden of 12 million cases and a yearly incidence of 1.5–2 million cases. During the past 10 years,

there has been a sharp increase in the number of recorded cases of the disease worldwide. In addition, a substantial number of cases are not recorded, as notification of the disease is compulsory in only 32 of the 88 affected

countries^(1,2). Although the disease is ranked ninth in terms of burden to the population as a single entity but remains neglected when addressed along with other infectious diseases.^(3,4) In Saudi Arabia, the disease is caused by *Leishmania major* in central and eastern provinces and *Leishmania tropica* in west and southwest provinces. The main vector of Cutaneous Leishmaniasis is *Phlebotomus sergenti*, and the disease affects males more than females^(5,6,7). Cutaneous Leishmaniasis attained epidemic proportions in 1973 and subsequently declined and reached a plateau in the mid-1980s⁽⁸⁾. In a retrospective study in Riyadh region between 1987 and 1990 Cutaneous Leishmaniasis incidence rate declined from 244.2 to 106.5 per 100,000 populations⁽⁹⁾. During the year 2000-2010, Cutaneous Leishmaniasis in the Eastern Region of Saudi Arabia showed higher incidence rate among males compared to females, it also showed declining trend among Saudi while increasing in expatriates⁽¹⁰⁾. Urbanization and extension of the cities, as the case in Saudi Arabia is a main risk factor. Other associated factors also found in Saudi Arabia are migration from rural to urban areas, socioeconomic, cultural, demographic, environmental changes as well as climatic disturbances⁽¹¹⁾.

The objective of this study was to determine the reporting trend of cutaneous Leishmaniasis in Majmaah, Saudi Arabia between 2007 and 2016

Research methods

The research design was descriptive, institu-

tional-based to study the trend of occurrence of Cutaneous Leishmaniasis in Majmaah, Saudi Arabia. The study was conducted in Majmaah city. Majmaah is the capital of Majmaah governorate in Riyadh Region in Saudi Arabia. The area of Majmaah governorate is around 30 000 square kilometers. The population of the governorate is about 97,349. Majmaah Governorate borders the Eastern Province and Al-Qassim on the north, Thadiq and Shagra on the south and Ramah to the east. The governorate borders Zulfi and al-Ghat on the west¹². King Khalid General Hospital is the main specialized hospital in Majmaah governorate; the hospital provides different specialized services for patients transferred from other hospitals, the primary health care centers as long as from the private health facilities. The patients suffering from dermatological illnesses in the area are referred to the department of dermatology in the hospital for specialized care and reporting.

Medical records of Cutaneous Leishmaniasis patients registered and treated at King Khalid Hospital, Majmaah, Saudi Arabia during 2007-2016 were reviewed and considered in this study. The surveillance database of cutaneous Leishmaniasis at the regional Vector Control Unit, Local Health Directorate, in Riyadh, Saudi Arabia was also used in this study.

The data were collected by a pre-tested checklist. The data were edited at the field and during data entry, cleaned, summarized using a master sheet and doubled entered into the

computer. The SPSS for Windows software, version 21 (SPSS, Chicago, Illinois, USA) was used to analyze the data. Descriptive statistics were used (frequency and standard deviation). Comparisons between qualitative variables were made using the person's Chi-square to test significance. P value less than 0.05 was considered significant. Ethical approval was obtained from the ethical committee of Majmaah University. All the data and information regarding this study were kept confidential and utilized only for the purpose of this study.

Results

Table (1) shows the social characteristics of patients with Cutaneous Leishmaniasis; patients less than 5 years of age were 10(11.5%), between 5 and 14 years were 17 (19.5%), between 15 and 44 years were 44 (50.6%) and more than 44 years were 16 (18.4%). The mean age of patients was 26.3 years. In this study, females constituted 78.2% and 21.8% respectively. Fifty-four patients (62.1%) were Saudi while 33 (37.9%) were non-Saudi. 29 (28.7%) of the patients were farmers, twenty-two (25.3%) were students, 16 (18.4%) were laborers, housewives/ no jobs were 6(6.9%). Other occupations constitute (13.8%). Most of the patients (95%) reside in Majmaah province.

The analysis showed that most of the patients had lesions which were dry (81.7%) while 34.9% of the participants showed secondary infection of the lesion seen in table (2).

Figure (1) shows the trend of the occurrence of Cutaneous Leishmaniasis in Majmaah, Saudi Arabia. The reported incidence of the disease was 33:100000 populations in 2007 and reached a peak 44:100000 populations in 2008 then started to decline to reach 4:100000 populations in 2016.

Table (3) shows the association between Cutaneous Leishmaniasis and social factors. In the first five years of the study (2007-2011), patients less than 15 years of age were 21(30.9%) while those 15 years of age and more were 47 (69.1%). In the second half of the study (2012-2016), patients less than 15 years of age were 4(21.1%) while those 15 years of age and more were 15 (78.9%); the above association is not significant ($p=0.11$).

During 2007-2011, the male and female patients with cutaneous Leishmaniasis were 82.4% and 17.6% respectively; while during 2012-2016, the ratio of male to female patients was 63.2% and 36.8% respectively; this association was statistically significant ($p=0.002$).

During 2007-2011, the Saudi patients diagnosed with cutaneous Leishmaniasis were 61.8% while non-Saudi patients were 38.2%; while during 2012-2016, this ratio of Saudi and non-Saudi patients was 63.2% and 36.8% respectively, this association was not significant ($p=0.84$).

Table (1): Social characteristics of patients with Cutaneous Leishmaniasis (n= 87)

Social characteristic	Number	Percent
Age:		
Less than 5	10	11.5
5-14	17	19.5
15-44	44	50.6
More than 44	16	18.4
Gender:		
Male	68	78.2
Female	19	21.8
Nationality:		
Saudi	54	62.1
Non-Saudi	33	37.9
Occupation:		
Farmer	25	28.7
Student	22	25.3
Laborers	16	18.4
Housewives	6	6.9
No job	6	6.9
Others	12	13.8
Residence in Majmaah province:		
Yes	83	95.8
No	04	4.2

Age: Min- max (years) = 3-90

Mean age (years) = 26.3

Table (2):**Characteristics of Cutaneous Leishmaniasis Lesion (n=87)**

Social characteristic	Number	Percent
Ulcer:		
Dry		
Moist	71	81.7
Presence of secondary infection:	16	16.3
Yes		
No	57	34.9
	30	65.1

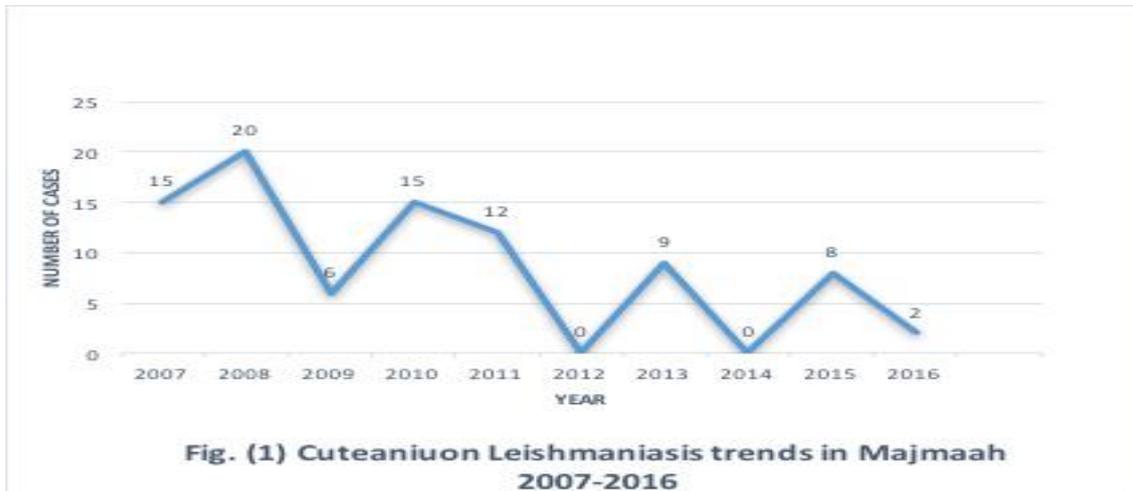


Table (3):

Cutaneous Leishmaniasis trends according to social characteristics

Social characteristic	Cases/years		Total	P
	(2007-2011) No. (%)	(2012-2016) No. (%)		
Age/ years:				
Less than 15	21(30.9%)	4 (21.1%)	25(28.7%)	0.11
15 and more	47(69.1%)	15(78.9%)	62(71.3%)	
Total	68(100.0%)	19(100.0%)	87(100.0%)	
Gender:				
Male	56 (82.4%)	12(63.2%)	68(78.2%)	0.002
Female	12(17.6%)	7(36.8%)	19(21.8%)	
Total	68(100.0%)	19(100.0%)	87(100.0%)	
Nationality:				
Saudi	42 (61.8%)	12(63.2%)	54(62.1%)	0.84
Expatriates	26 (38.2%)	7(36.8%)	33(37.9%)	
Total	68(100.0%)	19(100.0%)	87(100.0%)	

Discussion

Eighty-seven patients diagnosed with Cutaneous Leishmaniasis between 2007 and 2016 in Majmaah, KSA were included in this study. The total number of patients during 2007-

2011 were 68 patients while during 2012-2016 were 19 patients there is a significant decrease (percentage), with highest peak in 2008 (20 patients) and no reported cases in 2012 and 2014.

This total number of cases seems to be low and some cases may not be diagnosed due to under reporting. The remained untreated cases may act as a reservoir driving new transmission⁽¹³⁾. In the current study most of the reported lesions were dry⁽¹⁴⁾. This finding is consistent with conducted in Yemen in 2009 by Khatri ML et al.

Results showed that the disease is more prevalent among the 15-44 years age group; this finding is consistent with other studies^(15, 16, 14). A study conducted in Afghanistan in 2010 by Reithinger R showed that cutaneous Leishmaniasis reported incidence increases with age up to 15 years, after which prevalence levels off due to the acquisition of immunity⁽¹⁷⁾.

The disease showed declining trends between 2007 and 2016; the same trends was seen in some areas of the Middle East including Saudi Arabia^(9, 16). The main reason that could be attributed to this decline is the launch of the national control program head by Ministry of health, and the team work headed between Majmaah Health Care System and the regional Vector Control Unit. The main focus of the program is interrupting the disease transmission by controlling the vector by means of insecticide spray, use of insecticide-treated nets and control of animal reservoir hosts at suspected areas whenever there is reporting of a new case. The program is in collaboration with WHO and adopting its guidelines. Another factor in the decline of cases could be duo to under reporting. In other parts of the world the disease showed an increased

trend^(20,15). According to our study, no cases of cutaneous Leishmaniasis were reported in the years 2012 and 2014. This finding is consistent with the ministry of health data that in the year 2014 all regions of Saudi Arabia reported only eight cases⁽²¹⁾.

Our findings showed that the reported incidence of the disease is more prevalent among male gender compared to females; this finding is in line with other studies as males are more exposed to transmission of the disease due to their occupation and recreational social gathering in farms^(22,23,24). During 2007-2011 the females with the disease were very low but this number increased dramatically during 2012-2016; this increase in female compared to male patients is significant ($p=0.002$), decline trends among females was seen elsewhere⁽²⁴⁾. The rate of the disease among expatriates did not increase between 2007-2011 and 2014-2016; this finding contradicts another study conducted at Al Hassa in Saudi Arabia⁽¹⁶⁾.

Conclusion

The findings of this study concluded that the trends of occurrence of Cutaneous Leishmaniasis in Majmaah, Saudi Arabia declined during the past ten years. The disease was more prevalent among the older age group, the Saudis, and the male gender: However, the incidence of the disease among the females increased significantly during the last five years of the study. The study recommends application of an active surveillance system for Cutaneous Leishmaniasis and include the disease management, control and reporting at the primary health care level.

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Conflicts of interest

The author declares that, there is no conflict of interest regarding this research.

References

1. Poštigo JA (2010) Leishmaniasis in the World Health Organization Eastern Mediterranean Region *Int J Antimicrob Agents* 36 Suppl 1: S62–S65.
2. WHO. Leishmaniasis. Fact sheet N°375. Updated February 2015. (On line). From: <http://www.who.int/mediacentre/factsheets/fs375/en/>. (Accessed on 3.4.2017)
3. Reithinger R, Dujardin JC, Louzir H et al. Cutaneous Leishmaniasis. *Lancet Infect Dis* 2007;7: 581–596.
4. Hotez PJ, Remme JH, Buss P, Alleyne G, Morel C, et al. Combating tropical infectious diseases: report of the Disease Control Priorities in Developing Countries Project. *Clin Infect Dis*. 2004;38:871–878. [PubMed]
5. Al-Zahrani M, Peters W, Evans D, Smith V, Chin Chin I (1989) Leishmania infecting man and wild animals in Saudi Arabia. 6. Cutaneous Leishmaniasis of man in the south-west. *Trans R Soc Trop Med Hyg* 83: 621–628. Doi: 10.1016/0035-9203(89)90376-3. pmid:2617623
6. Bounoua L, Kahime K, Houti L, Blakey T et al. Linking climate to incidence of zoonotic cutaneous leishmaniasis (*L. major*) in pre-Saharan North Africa. *Int J Environ Res Public Health*. 2013 Jul 31; 10(8):3172-91.
7. WHO. Cutaneous Leishmaniasis in Saudi Arabia. *Neglected Tropical Disease*. (On line) From: <http://www.emro.who.int/neglected-tropical-diseases/countries/cl-saudi.html> Accessed on 3.4.2017
8. Al-Tawfiq JA1, AbuKhamis A. Cutaneous leishmaniasis: a 46-year study of the epidemiology and clinical features in Saudi Arabia (1956-2002) *Int J Infect Dis*. 2004 Jul;8(4):244-50.
9. Al-Shammari SA1, Khoja TA, Fehr A. Cutaneous leishmaniasis in Riyadh region: four-year study of the epidemiologic and clinical features. *Int J Dermatol*. 1992 Aug;31(8):565-7.
10. Al_Majmaah, Saudi Arabia (online) From: https://en.wikipedia.org/wiki/Al_Majmaah (accessed on 12.12.2016)
11. Kamhawi S, Modi GB, Pimenta PF, Rowton E, Sacks DL. The vectorial competence of *Phlebotomus sergenti* is specific

- for *Leishmania tropica*
12. Al_Majma'ah, Saudi Arabia. En.wikipedia.org/wiki/Al_Majma'ah. From: <https://www.google.com.sa/>
 13. Ashford R. Cutaneous Leishmaniasis in Kabul: observations on a prolonged epidemic. *Ann Trop Med Parasitol.* 1992; 86:361–71. [PubMed]
 14. Khatri ML, MuccioTD, Gramiccia M. Cutaneous Leishmaniasis in North-Western Yemen: A clinic epidemiologic study and *Leishmania* species identification by polymerase chain reaction–restriction fragment length polymorphism analysis. *Journal of the American Academy of Dermatology* 2009; Volume 61 (4): 15–e21
 15. Hamza VY, Khademi N. Trend of Cutaneous Leishmaniasis in Kermanshah Province, West of Iran from 1990 to 2012. *Iran J Parasitol.* 2015 Jan-Mar; 10(1): 78–86. Doi: 10.1016/S1995-7645(13)60116-9.
 16. Amin TT, Al-Mohammed HI, Kaliyadan F, Mohammed BS. Cutaneous Leishmaniasis in Al Hassa, Saudi Arabia: epidemiological trends from 2000 to 2010. *Asian Pac J Trop Med.* 2013 Aug; 6(8):667-72. Doi: 10.1016/S1995-7645(13)60116-9.
 17. Reithinger R, Mohsen M, Leslie T. Risk Factors for Anthroponotic Cutaneous Leishmaniasis at the Household Level in Kabul, Afghanistan. *PloSNegl Trop Dis.* 2010 Mar; 4(3): e639. Doi: 10.1371/journal.pntd.0000639.
 18. World Health Organization (2014) WHO Leishmaniasis Resource: Saudi Arabia. Available: www.who.int/leishmaniasis/resources/SAUDI_ARABIA.pdf Accessed 27 March 2017.
 19. Salam N, Al-Shaqha WM and Azzi A. Leishmaniasis in the Middle East: Incidence and Epidemiology. *PLoS-Negl Trop Dis.* 2014 Oct; 8(10): e3208 Doi: 10.1371/journal.pntd.0003208
 20. Bekele S, Bekele Y, Mulatu F, Lemma T, Tilahun H, Gadisa E, Negussie S, Yamuah L, Wassie L, Abebe M, Hiletework M, Hunegnaw M, Leekassa R, Bizuneh E. Recent trends of cutaneous Leishmaniasis in Alert Hospital, Addis Ababa. *Ethiop Med J.* 2014 Jan; Suppl 1:37-41.
 21. El-Beshbishy HA, Al-Ali KH, El-Badry AA (2013) Molecular characterization of cutaneous leishmaniasis in Al-Madinah Al-Munawarah province, western Saudi Arabia. *Int J Infect Dis* 17: e334–e338 [PubMed]
 22. Araujo AR, Portela NC, Feitosa APS, da Silva OT, Arraes RA, XIMENES RA, Alves LC and Brayner FA. Risk factors associated with American Cutaneous Leishmaniasis in an endemic area of Brazil. *Rev Inst Med Trop Sao Paulo.* 2016; 58: 86. Doi: 10.1590/S1678-9946201658086
 23. Aara N, Khandelwal K, Bumb RA, Mehta RD, Ghiya BC, Jakhar R, Dodd C, Salotra P, Satoskar AR. Clinico-Epidemiologic Study of Cutaneous Leishmaniasis in Bikaner, Rajasthan, India. *Am J Trop Med Hyg.* 2013 Jul 10; 89(1): 111–115. Doi: 10.4269/ajtmh.12-0558
 24. Hadad MHF, KassiriH , Kasiri N, A, Lotfi M. Prevalence and epidemiologic profile of acute cutaneous Leishmaniasis in an endemic focus, Southwestern Iran. *Journal of Acute Disease* 2015; Volume 4 (4): 292–297

Original Article

Prevalence of mental distress among undergraduate medical students at Majmaah university, Kingdom of Saudi Arabia

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Abstract

Background: Medical Education and Medical Profession are among the most challenging and stressful ones. It also poses many new, challenging and potentially threatening situational demands on the incoming students. Anxiety and depression represents an escalating public health problem among medical students. **Objectives:** The objectives of the study were; to find the prevalence of mental distress among undergraduate medical students studying at College of Medicine, Majmaah University; to explore associations between socio-demographic characteristics and mental distress and to identify mental health and support service needs at Majmaah University for distressed students. **Methods:** It was a cross-sectional study. The data was collected from undergraduate medical students' of ei-

المخلص

مقدمة : يعد التعليم الطبي والمهنة الطبية من بين أكثر المجالات التي تطلب تحدياً وجهداً (حيث أنه يطرح العديد من المطالب الجديدة المقترنة بالصعوبات والتي يمكن أن تشكل تحدياً على الطلاب المستجدين. كما أن القلق والاكتئاب يمثلان مشكلة صحية عامة متصاعدة بين طلاب الطب.

الأهداف: تهدف الدراسة الى معرفة مدى انتشار الضغوط النفسية بين طلاب وطالبات كلية الطب المنتظمين بجامعة المجمعة. وكذلك استكشاف الروابط بين الخصائص الاجتماعية والديموغرافية والضغوط النفسية ومعرفة ما اذا كان هنالك احتياج لتقديم خدمات للصحة النفسية والدعم للطلبة الذين يعانون من الضغوط في جامعة المجمعة.

الطريقة: هذه دراسة مقطعية حيث تم جمع البيانات من كلا الجنسين للطلاب الذين يدرسون في كلية الطب بجامعة المجمعة وذلك باستخدام طريقة العد الكامل. تم الأستعانة بإستبيان الصحة العامة (جي انش كيو-٢٨) لجمع البيانات من ١٦٢ طالباً وطالبة.

ther gender studying at College of Medicine, Majmaah University using complete enumeration method. General Health Questionnaire (GHQ-28) was used to collect the data from 162 students. **Result:** The prevalence of mental distress among students was 35.8%. Psychosocial disorder (27.2%) was the most prevalent among students, followed by anxiety (24.7%), somatic (14.2%) and depression (10.5%). Male students had higher mental distress as compared to female students (67.6% vs 43.5%, $p < 0.001$). Moreover, third year students had higher anxiety level (42.1%) as compared to other year students $p < 0.001$. **Conclusion:** Medical students encountered high rates of anxiety and depression. Male students were more mentally distressed as compared to female students. Anxiety was more prevalent in 3rd year students as compared to other groups. Educating the students through stress management programs and counselling them through mental health units in the College may help in overall reduction of mental distress.

Keywords: Mental distress, stress, medical students, anxiety, depression

النتائج: بشكل عام كان معدل انتشار الضغوط النفسية لدى الطلبة من الجنسين ٣٥,٨٪. وكان الاضطراب النفسي الاجتماعي (٢٧,٢٪) يعد الأكثر انتشاراً، يليه القلق (٢٤,٧٪)، والجسدية (١٤,٢٪) والاكتئاب (١٠,٥٪). يعاني الطلاب الذكور من الضغوط النفسية بدرجة أعلى مقارنة بالطلبات (٦٧,٦٪ مقابل ٤٣,٥٪ $P < ٠,٠٠١$). وعلاوة على ذلك، كان طلاب السنة الثالثة هم الأعلى مستوى من حيث القلق (٤٢,١٪) بالمقارنة مع طلاب السنوات الأخرى ($P < ٠,٠٠١$).

المستخلص: يعاني طلاب الطب معدلات عالية من القلق والاكتئاب. الطلاب الذكور أكثر معاناة من حيث الضغوط النفسية بالمقارنة مع الطالبات. وأيضاً « كان القلق أكثر انتشاراً بين طلاب السنة الثالثة بالمقارنة مع السنوات الأخرى. كما أن تثقيف الطلبة عن طريق برامج إدارة الإجهاد وإسداء المشورة لهم من خلال وحدات الصحة النفسية في الكلية قد يسهم في الحد بشكل عام من الضغوط النفسية.

Introduction:

Mental health is an undivided part of health and well-being, as have been stated in the definition of health in the Constitution of the World Health Organization: "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity⁽¹⁾. Mental Illnesses refer collec-

tively to a number of disorders and are characterized by sustained, abnormal alterations in thinking, mood, or behavior associated with distress and impaired functioning⁽²⁾. Recent evidence from the World Health Organization indicates that mental illness affects nearly half the population worldwide⁽³⁾. Mental health among university students represents an im-

portant and growing public health concern for which epidemiological data are needed^[4]. Medical education poses many new, challenging and potentially threatening situational demands on the incoming student⁽⁵⁾. Furthermore, Medical students face several stresses during their revolution from insecure students to young knowledgeable physicians^(6,7,8). This can lead to mental distress with negative impact on their cognitive functioning and learning^(9,10). The main purpose of medical schools is to facilitate and foster students' learning through a safe and supportive environment⁽¹¹⁾. The estimated prevalence of psychological disturbances reported in different studies among medical students is higher than that in the general population^(12, 13, 14). A Swedish study done in 2011, reported a 12.9% prevalence of depression among medical students and a total of 2.7% had made suicidal attempts⁽¹⁵⁾. In 2008, at USA, approximately 50% of medical students experienced stress and burnout and 10% experienced suicidal ideation during their study at medical school⁽¹⁶⁾. Another study in 2004 conducted in Malaysia, reported that 41.9% of the medical students have mental stress⁽¹⁷⁾. The corresponding stress rates among medical students in Thailand and Saudi Arabia were 61.4%⁽¹⁸⁾ and 57%⁽¹⁹⁾ respectively. In Arab world, a comparative study conducted among male medical students in Mansoura University, Egypt and King Faisal University, Al-Hassa, Saudi Arabia concluded that anxiety & depression represented a prevalent problem in both countries⁽²⁰⁾. In Saudi Arabia, a cross-sectional study conducted in

Riyadh, King Saud University, reported high prevalence of depressive symptoms (48.2%) among medical students, it was either mild (21%), moderate (17%), or severe (11%)⁽²¹⁾.

Another study done in Jazan University, 2012, reported high prevalence of stress among medical students (71.9%)⁽²²⁾. Another study conducted by Ibrahim et al in 2010 at King Abdul-Aziz University, Jeddah, concluded that Prevalence of morbid anxiety and depression among female medical students was 34.9% and 14.7%, respectively⁽²³⁾. Thus, mental disorders represent escalating mental health problems among medical students worldwide. However, there are few studies have been conducted among medical students in Riyadh region despite the expanding numbers of medical schools. Therefore, this study was planned to find out the prevalence & main predictors of anxiety & depression among medical students studying at Majma'ah University, Riyadh region, Saudi Arabia.

Material and Methods:

It was a cross-sectional study by design. The data was collected from January – March 2015 using complete enumeration sampling method. A total of 162 medical students (139 male and 23 female students) were interviewed during this time period. The study was conducted at College of Medicine, Majmaah University. It's a newly established Medical College in 2011. The University is located in Almajmaah City which lies to the north of Riyadh City and is considered as one of Al-

Riyadh Province governorates. The estimated population of Al-Majmaah City is approximately 130000 comprising of citizens and residents^[24]. The data was collected by using the General Health Questionnaire (GHQ-28), which was a self-administered screening instrument, designed to detect the current diagnosable psychiatric disorders. It was used in the surveys and clinical settings to identify the potential cases, leaving the task of diagnosing the actual disorders to a psychiatric interview^[25, 26]. The GHQ-28 item version was introduced incorporating the four sub scales of somatic, anxiety, social dysfunctions, and severe depressive symptoms^[25]. Each question has four responses. The participants' answers were scored as 0-0-1-1 based on their responses. The total score was determined by adding the score obtained for each answer in the questionnaire. Compared to other versions of the GHQ-short versions; 12 and 30 - the 28 item version was found to be the best in sensitivity (100%), specificity (81.9%), and overall misclassification rate (17.5%), when used in the 4 / 5 casernes threshold score. The GHQ-28 was translated into Arabic language and validated at King Khaled University Hospital in Riyadh^[27]. The Cronbach Alpha was 0.77. The questionnaire comprised of two sections: The first part was about the socio-demographic characteristics and the second part related to GHQ-28. The data were entered and analyzed using SPSS 23.0. Mean±S.D was given for quantitative variables. Frequencies and percentages were given for qualitative variables. Pearson Chi Square was applied

to observe associations between qualitative variables. A p-value of <0.05 was considered as statistically significant. The study was approved by the ethical committee of Majmaah University. The students consent was also obtained prior to filling the questionnaires. All information was kept purely confidential and was only used for statistical analysis.

Results:

The mean age of the students was 19.21±2.21 years. The data was collected from 162 medical students of which n = 139 (85.5%) were male students and n = 23 (14.2%) were female students. About three fourth of the students were studying in 2nd year n=76 (46.9%), n=38(23.5%) were studying in the 3rd year, n=27(16.7%) were studying in 4th year and 21(13%) students were studying in 5th year. Only 3.1% of the students were married the remaining 96.9% were singles. About three fourth of the students (75.9%) were living in Majmaah City, whereas, n=39 (24.1%) were non-boarders. Majority of the students n=73 (45.1%) were living with their families, n=57 (35%) students were living alone and n=32(19.8%) were living with a friend. More than 50 % of the students had more than 7 family members, n=67 (41.4%) had family members between 4-7 persons and only a small percentage n=10 (6.2%) had family members less than 4 members. Majority chunk of the students were non-smokers n=135 (83.3%). Around 15 % of the students were smokers (smoking shisha and cigarettes), whereas, only 1.9% students were

ex-smokers. We also collected data on Educational status of both parent and were assessed separately. Regarding mothers education; majority of them were having University degrees n=61 (37.7%), n=39 (24.1%) had secondary school certificate, about one fifth had primary school certificate and a small percentage were illiterate. Regarding father's education; majority of them were having University degrees n=96 (59.3%), n=33 (20.4%) had secondary school certificate and a small percentage n=6 (3.7%) were illiterate Table 1

As stated supra, the GHQ-28 item version was used. It is further divided into four sub scales; somatic, anxiety, social dysfunctions, and severe depressive⁽²⁵⁾. Each question in the sub-scale had four responses. Overall mental distress was prevalent in n=58 (35.8%) of the students, of which n=13 (22.4%) were females and n=45 (77.6%) were males. Psycho-

social distress was prevalent in majority of the students n=44 (27.2%), followed by anxiety n=40 (24.7%), somatic distress n=23 (14.2%) and depression n=17 (10.5%) as shown in table 2. Mental distress was significantly associated with gender (p=0.025) showing that males are more mentally distressed than female students table 3. Year of study was also significantly associated with anxiety (p=0.006) showing that 3rd year students had higher level of anxiety as compared to other students studying in different years table 4. Residency, place of residence and smoking were not significantly associated with mental distress (p>0.05) respectively.

Table 1: Socio-demographic data of students (N = 162)

Item	No. (%)	Item	No. (%)
Gender		Number of family members	
Male	139 (85.8%)	<4	10 (6.2%)
Female	23 (14.2%)	4-7	67 (41.4%)
		>7	85 (52.5%)
Academic year		Smoking status	
Second year	76 (46.9%)	currently smoker	24 (14.8%)
Third year	38 (23.5%)	ex-smoker	3 (1.9%)
Fourth year	27 (16.7%)	never smoked	135 (83.3%)
Fifth year	21 (13.0%)		

Mother education			
Illiterate	19 (11.7%)	Type of smoking	
Primary	27 (16.7%)	Shisha	11 (6.8%)
Intermediate	16 (9.9%)	Tobacco cigarettes	10 (6.2%)
Secondary	39 (24.1%)	Shisha and tobacco	3 (1.9%)
University	61 (37.7%)	Place of residency	
Father education		Inside Majmaah	123 (75.9%)
Illiterate	6 (3.7%)	Outside Majmaah	39 (24.1%)
Primary	12 (7.4%)	Residency	
Intermediate	15 (9.3%)	Alone	57 (35.2%)
Secondary	33 (20.4%)	With family	73 (45.1%)
University	96 (59.3%)	With a friend or else	32 (19.8%)
Marital status			
Married	5 (3.1%)		
Single	157 (96.9%)		

Table 2: Prevalence of mental distress in students and its sub-scales (N=162)

	Negative	Positive
Somatic	139 (85.8%)	23 (14.2%)
Anxiety	122 (75.3%)	40 (24.7%)
Psychosocial	118 (72.8%)	44 (27.2%)
Depression	145 (89.5%)	17 (10.5%)
Overall mental distress	104 (64.2%)	58 (35.8%)

Table 3: Association between mental distress and gender (N=162)

Gender	Mental distress		Total
	Positive	Negative	
Male	45 (32.4%)	94 (67.6%)	139
Female	13 (56.5%)	10 (43.5%)	23
Total	58 (35.8%)	104 (64.2%)	162
Pearson Chi Square = 5.007, p=0.025			

Table 4: Association between anxiety and academic year (N=162)

Academic year	Anxiety		Total
	Negative	Positive	
Second	66 (86.9%)	10 (13.1%)	76
Third	22 (57.9%)	16 (42.1%)	38
Fourth	20 (74.1%)	7 (25.9%)	27
Fifth	14 (66.7%)	7 (33.3%)	21
total	122 (75.3%)	40 (24.7%)	162
Pearson Chi Square = 12.499, p=0.006			

Discussion:

Medicine has always been regarded as a popular choice in tertiary education. As a result of an excess of applicants, only candidates with excellent academic attainment can successfully enter Medicine. Therefore, the medical program is even more competitive and stressful for students who are accepted^[28] if this stress is ignored; they are likely to produce further stresses^[29]. The current study found that one in two students was screened positive for mental distress. The overall prevalence of mental distress among undergraduate medical students was 35.8%. These results go in-line with the study conducted in USA^[16] and Malaysia^[8] that reported; approximately 50% of students experienced stress & burnout and 10% experienced suicidal ideation during medical school and that 41.9% of the medical students have mental stress respectively. The present study illustrated the presence of high level of psychosocial (27.2%) and anxiety (24.7%) among medical students. These results partially agree with most studies carried out locally and internationally which stated that highest levels of distresses were anxiety

and depression^[30]. Also, comparing our findings with other studies conducted in Saudi Arabia, the prevalence of depressive symptoms among medical students was 48.2%^[21] and another study conducted in Jazan University, reported that the prevalence of stress among medical students was 71.9%.

Regarding level of depression, our study results are not in line with the studies conducted in US, Canada and Saudi Arabia. The level of depression among medical students in our study was only 10.5% as compared to 23.7% in USA, 21.4% in Canada and 19.5% in Jeddah^[23]. In our study, male medical students had higher level of mental distress. This goes with the study conducted in France^[28] in which mental distress was more prevalent in males than females. Another significant finding in our study was that the students studying in third year had higher level of anxiety as compared to other groups. Again this finding is confirmatory by a study conducted in USA and Canada^[30] in which students studying in 3rd year had higher level of anxiety as compared to other years. In our study no significant association was observed between men-

tal distress and smoking, type of residency and place of residency $p > 0.05$ respectively.

Limitations of the study:

Firstly, College of Medicine, Majmaah University is a newly established institution; the number of medical undergraduates (males and females) is on the lower – slung. Female College commenced in 2014. Apart from that, male undergraduates are also less in number as compared to other established institutions. Secondly, this is a cross sectional study on small population. With passage of time further study is required using larger sample size.

Conclusion:

Medical students encountered high rates of anxiety and depression. The overall prevalence of mental distress among medical students was 35.8%. Male students were more distressed than female students. Anxiety was more prevalent in 3rd year students as compared to other groups. Educating the students through stress management programs and counselling them through mental health units in the College may help in overall reduction of mental distress. College of Medicine, Majmaah University is advised to provide a functional mental health service & support unit for students. The unit conducts psychological assessment of the students on regular basis. Stress management courses are recommended to be arranged for the students on periodical basis. Student mentors are to be trained about how to identify and counsel the distressed students.

References:

1. World Health Organization. Basic Document. Forty Seventh Edition, 2009, Geneva, Switzerland. Last assessed May 20, 2015.
2. Reeves WC, Strine TW, Pratt LA, Thompson W, Ahluwalia I, Dhingra SS. Mental Illness Surveillance among Adults in the United States. Centers for Disease Control and Prevention. MMWR / September 2, 2011 / Vol. 60.
3. World Health Organization. Gender and women's health. Available from URL: http://www.who.int/mental_health/prevention/gender_women/en/. Last accessed 20 April 2015.
4. Eisenberg D, Hunt J, Speer N. Mental health in American colleges and universities: variation across student. *J NervMent Dis* 2013; 201:60-7.
5. Abdulghani HM. Stress and Its Effects on Medical Students: A Cross-sectional Study at a College of Medicine in Saudi Arabia. *J Health Popul Nutr* 2011; v.29 (5), 516–522.
6. Shah M, Hasan S, Malik S and Sreeramareddy CT. Perceived Stress, Sources and Severity of Stress among medical undergraduates in a Pakistani Medical School. *BMC Medical Education* 2010, 10:2 doi: 10.1186/1472-6920-10-2.
7. Ahmed I, Banu H, Al-FageerR, Al-Suwaidi R. Cognitive emotions: depression and anxiety in medical students and staff. *J Crit Care* 2009; 24:e1-7.
8. Sohail N. Stress and academic performance among medical students. *J Coll Physicians Surg Pak* 2013; 23:67-71.
9. Niemi PM, Vainiomäki PT. Medical students' distress—quality, continuity and gender differences during a six-year medical programme. *Medical teacher*. 2006 Jan 1;28(2):136-41.
10. Kessler R, Berglund, P, Borges G, Nock M, & Wang P. Trends in suicide ideation, plans,

- gestures, and attempts in the United States, 1990-1992 to 2001-2003. *JAMA* 2006; 293, 2487-2495.
11. Snadden D. Student health and abuse: What is going on out there? *Med Teach* 2003; 25:461-462.
 12. Moffat KJ, McConnachie A, Ross S, Morrison JM. First year medical student stress and coping in a problem-based learning medical curriculum. *Medical education*. 2004 May 1;38(5):482-91.
 13. Zaid ZA, Chan SC, Ho JJ. Emotional disorders among medical students in a Malaysian private medical school. *Singapore medical journal*. 2007 Oct;48(10):895.
 14. Dyrbye LN, Thomas MR, Shanafelt TD. Medical student distress: causes, consequences, and proposed solutions. In *Mayo Clinic Proceedings* 2005 Dec 31 (Vol. 80, No. 12, pp. 1613-1622). Elsevier.
 15. Dahlin M. Stress and depression among medical students: a cross-sectional study. *Med Educ* 2005;39 (6), 594-604.
 16. Dyrbye LN, Thomas MR. Burnout and suicidal ideation among U.S. medical students. *Ann Intern Med* 2008;149 (5), 334-41.
 17. Sherina MS, Rampal L, Kaneson N. Psychological stress among undergraduate medical students. *Med J Malaysia* 2004, 59:207-11.
 18. Saipanish R. Stress among medical students in a Thai medical school. *Med Teach* 2003;25:502-6.
 19. Abdulghani HM, AlKanhal AA, Mahmoud ES, Ponnampereuma GG, Alfaris EA. Stress and its effects on medical students: a cross-sectional study at a college of medicine in Saudi Arabia. *J Health Popul Nutr* 2011;29:516-22.
 20. El-Gilany AH, Amr M, Hammad S. Perceived stress among male medical students in Egypt and Saudi Arabia: effect of sociodemographic factors. *Ann Saudi Med* 2008, 28:442-8.
 21. Al-Faris EA. The prevalence and correlates of depressive symptoms from an Arabian setting: a wakeup call. *Med Teach* 2012;34(1),1:S32-6. doi: 10.3109/0142159X.2012.656755.
 22. Sani M. Prevalence of stress among medical students in Jizan University, Kingdom of Saudi Arabia. *GMJ* 2012; 1 (1), 19-25.
 23. IBRAHIM N. Prevalence and Predictors of Anxiety and Depression among Female Medical Students in King Abdulaziz University, Jeddah, Saudi Arabia. *Iranian J Publ Health* 2013; 42 (7), 726-736.
 24. Majmaah University. Al Majmaah Governorate. [ONLINE] Available at: <http://www.mu.edu.sa/en/campuses/main-campus>. [Accessed 28 November 14].
 25. Ferwana MS. Effect of psychiatric training course on GPs ability to detect psychiatric disorders, and their attitudes toward these disorders. (Thesis) 2000:28:52-4.
 26. Sreeramareddy CT, Shankar PR, Binu VS, Mukhopadhyay C, Ray B, Menezes RG. Psychological morbidity, sources of stress and coping strategies among undergraduate medical students of Nepal. *BMC Medical education*. 2007 Aug 2;7(1):26.
 27. Al-Fares EA, Al-Shammari SA, Al-Hamad IS. Prevalence of psychiatric disorders in an academic primary care center in Riyadh. *Saudi Med J* 1992;13:49-53.
 28. Baldassin S, Silva N, de Toledo Ferraz Alves TC, Castaldelli-Maia JM, Bhugra D, Nogueira-Martins MC, de Andrade AG, Nogueira-Martins LA. Depression in medical students: Cluster symptoms and management. *J Affect Disord* 2013 Aug 15;150(1):110-4. Doi: 10.1016/j.jad.2012.11.050. Epub 2012 Dec 25.
 29. Sidik S, Rampal L, Kaneson N, Prevalence of emotional disorders among medical students in a Malaysian university, *Asia Pacific Family Medicine*, 2003; 2:213-217. Downloaded from http://www.apfmj-archieve.com/afm2.4/afm_89.pdf (last assessed on 21/12/12)

30. Dyrbye LN, Thomas MR, Shanafelt TD. Systematic review of depression, anxiety, and other indicators of psychological distress among U.S. and Canadian medical students. *Acad Med* 2006, 81:354-73.

Original Article

Knowledge and Attitude of secondary school students in Sudair area, Saudi Arabia about Middle East Respiratory Syndrome Coronavirus (MERS-CoV)

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Abstract

Background: With increase prevalence of Middle East Respiratory Syndrome (MERS), Saudi population is at risk of being infected with the condition. The objectives of this study were to determine the knowledge and evaluate the attitude of secondary school male students in Sudair area, KSA about MERS-CoV

Methods: In this cross-sectional study, whole students were selected in all three schools, 386 secondary school male students in Sudair area, KSA were selected. A semi-structured questionnaire was utilized to collect the data. The sample size was calculated as 386 and Statistical Package for Social Sciences (SPSS) was used for data analysis after obtaining the ethical approval.

المخلص

خلفية: مع زيادة انتشار متلازمة الشرق الأوسط التنفسية، فإن السكان السعوديون معرضون لخطر الإصابة بالعدوى. أهداف هذه الدراسة هي تحديد المعرفة وتقييم سلوك طلاب المرحلة الثانوية من الذكور في منطقة سدير بالمملكة العربية السعودية حول متلازمة الشرق الأوسط التنفسية

طريقة البحث: في هذه الدراسة المقطعية، تم اختيار 386 طالبا من طلاب المرحلة الثانوية في منطقة سدير بالمملكة العربية السعودية. استخدم استبيان شبه منظم لجمع البيانات. تم استخدام الحزمة الإحصائية للعلوم الاجتماعية (SPSS) لتحليل البيانات بعد الحصول على الموافقة الأخلاقية من الطلاب. **النتائج:** أظهرت الدراسة أن مستوى معرفة فيروس كورونا المسبب لمتلازمة الشرق الأوسط التنفسية بين الطلاب الذكور في المدارس الثانوية في منطقة سدير هو (42%) وأن (71%) من الطلاب لديهم سلوك إيجابي تجاه فيروس كورونا المسبب لمتلازمة الشرق الأوسط التنفسية. وجدت الدراسة أن لدى ثلاثين (81.1%) من الطلاب الذين

Results: The study showed that the level of knowledge of MERS-CoV among male students at secondary schools in the Sudair area was (42%) and 71% of the sample had positive attitude towards MERS-CoV. Thirty (81.1%) of students who had illiterate mothers had adequate MERS-CoV knowledge. Adequate MERS-CoV knowledge was found in 47 (65.3%) of students whose mothers had primary school education and 147 (53.1%) for students whose mothers had above primary school education.

Conclusion: The study concluded that the secondary school students' knowledge of MERS-CoV in Sudair area, Saudi Arabia is inadequate. However, most of the students have positive attitude towards the disease. The students' MERS-CoV knowledge is significantly associated with mothers' education.

Keywords: MERS-CoV; knowledge, attitude, secondary school male students.

لديهم أمهات أميات معرفة كافية بفيروس كورونا المسبب لمتلازمة الشرق الأوسط التنفسية وأن 47 (65.3%) من الطلاب الذين تحصلت أمهاتهم على التعليم الابتدائي لديهم معرفة كافية بالمتلازمة مقابل 147 (353%) من الطلاب الذين تحصلت أمهاتهم على التعليم فوق الابتدائي بالتتابع.

المستخلص: خلصت الدراسة إلى أن معرفة طلاب المدارس الثانوية بمتلازمة الشرق الأوسط التنفسية في منطقة سدير بالمملكة العربية السعودية غير كافية. ومع ذلك، فإن معظم الطلاب لديهم موقف إيجابي تجاه المرض. ترتبط معرفة الطلاب بمتلازمة الشرق الأوسط التنفسية بشكل كبير بتعليم الأمهات

Introduction

Middle East respiratory syndrome (MERS) is a viral respiratory disease caused by a novel corona virus (MERS-CoV) that was first identified in Saudi Arabia in 2012. The virus was detected later in United Arabs Emirates, Qatar, Oman, and Jordan⁽¹⁾.

MERS-CoV infection can appear asymptotically or rapidly progresses to viral pneumo-

nia with severe acute respiratory syndrome, septic shock and multi-organ failure about a week after onset of infection. Typically, the disease begins with fever and cough, chills, sore throat, myalgia and arthralgia, followed by dyspnea. At least one-third of the patients complain of vomiting and diarrhea, almost half suffer from pneumonia and about 10% develop an acute respiratory distress syndrome (ARDS) ^(2, 3). The sudden appearance

and potential lethality of severe acute respiratory syndrome (SARS)-associated coronavirus (SARS-CoV) in humans has resulted in a focusing of new attention on the determination of both its origins and evolution^(4, 5). Three genetically distinct lineages of MERS-CoV were observed and documented in Riyadh with 21 MERS-CoV genomes. It is believed that Riyadh infections were unlikely to result from single continuous human-to-human transmission chain⁽⁶⁾. The rates of MERS-CoV cases and deaths are higher in men than in women and those in the age groups of 45–59 and < 60 years had the highest case fatality rate⁽⁷⁾.

Since March 2014, the frequency of MERS-CoV infection reported cases is increasing, with the majority of recent cases reported in Saudi Arabia and United Arab Emirates. In addition, the frequencies with which travel-associated MERS cases have been reported and the numbers of countries that have reported them to the World Health Organization (WHO) have also increased⁽⁸⁾. A study about Knowledge and attitude of healthcare workers about Middle East respiratory syndrome was conducted in Qassim, Saudi Arabia, showed

good knowledge and positive attitude towards the syndrome⁽⁹⁾. Another study was conducted to determine the awareness level of dental students at Al-Farabi Colleges, Jeddah toward Middle East Respiratory Syndrome-coronavirus showed that more than half of the dental students (54%) interviewed had good knowledge about MERS-CoV⁽¹⁰⁾. Another study was conducted in Jeddah, KSA among general population showed a good level of knowledge and level of attitude is reasonable⁽¹¹⁾.

The objectives of this study were to determine the knowledge and attitude of secondary school male students about MERS-CoV; to determine the relation between knowledge about MERS-CoV and the social characteristics as well as academic performance of the students

Subjects and methods

The design was cross-sectional study to determine knowledge and attitude of secondary school male students about Middle East Respiratory Syndrome Corona virus (MERS-CoV). The study was conducted in Sudair area which includes HawtatSudair and Rawdat Sudair which are located in the central region

of Saudi Arabia. The villages which surround these cities were also included in the study.

The sample included 386 male secondary school students between the age of 15 and 19 years who enrolled in three different schools. The data were collected using a pre-tested questionnaire. The questionnaire contained questions about socio demographic factors, school year Level, academic performance and mother education. Knowledge of students about MERS-CoV (causative organism, transmission, reservoir, prevention, control and treatment) was assessed. Students have been assessed by answers of their knowledge about MERS-CoV in question sheet. Nine questions regarding knowledge were asked. The students who answered correctly five to nine questions were considered to have adequate knowledge while those who answered correctly less than five questions were considered to have inadequate knowledge.

Attitude of the students about MERS-CoV was also evaluated. Five questions were asked. The student who had three or more positive approaches towards MERS-CoV was considered to have a positive attitude: however if the student has one or two positive ap-

proaches towards the syndrome was considered to have a negative attitude.

The data was analyzed by SPSS version 22, applying Pearson's Chi Square to confirm association between variables. All the analyses were conducted at an alpha level of 0.05. The ethics committee of Basic Medical and Health Research Center (BMHRC) of Majmaah University gave the ethical approval of the study. Consents were obtained from all respondents.

Results

Table 1 shows the Social characteristics of the sample. For the age, there were 127(33%) younger than 17 years, 226(58.5%) aged 17-18 years, and 33(8.5%) older than 18 years of age. Regarding distribution of the students in the school, 158(40.9%) were from Almajel, 129(33.4%) were from Megren, and 99(25.6%) were from Rawdat Sudair. For the school year level, 152(39.4%) were in the 1st year, 131 (33.9%) in the 2nd year and 103 (26.7%) in the 3rd year. Regarding academic performance, excellent students were 160 (41.5%), very good were 131(33.9%), good were 65(16.8%) and poor were 30(7.8%). For the mother education, results showed that 72(18.7%) were primary school educated,

166(43.0%) were intermediate and secondary school educated and 111(28.8%) were university and above graduates. The illiterate mothers constituted 9.6% of the sample. Regarding father education, there were 68(17.6%) primary school educated, 151 (39.2%) were intermediate and secondary school educated, 141(36.5%) were university and above graduates. The illiterate fathers were 26 (6.7%). Regarding family income, 104(26.9%) had lower family income, 124 (32.1%) had moderate family income and 158(40.9%) had poor family income.

Figure 1 shows the level of knowledge of MERS-CoV among the participants. The level of knowledge is adequate in 42% of the participants .Figure 2 shows the level of students 'attitude towards MERS-CoV which was positive in 70.7% of the students.

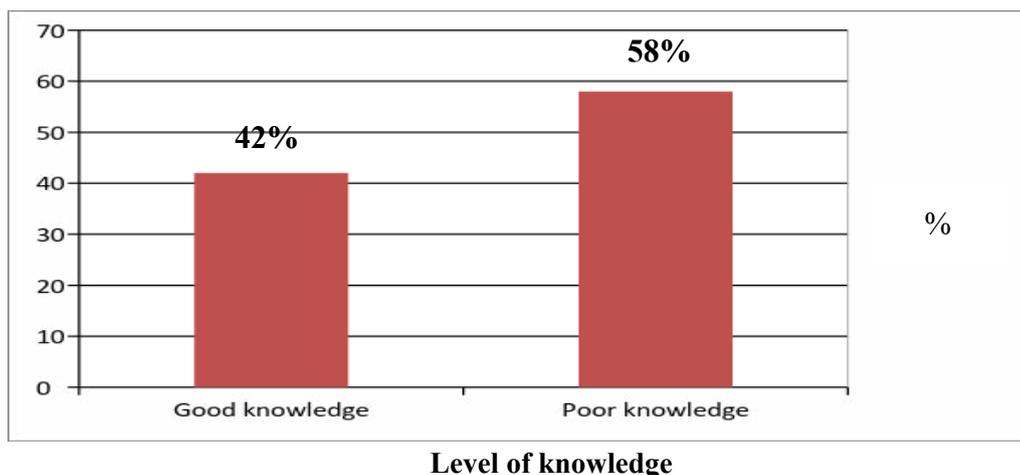
Table 2 shows the relation between level of knowledge and mother education. 30 (81.9%) of students of illiterate mothers have adequate MERS-CoV knowledge, while 7(18.9%) is inadequate. Adequate MERS-CoV knowledge is adequate for 65.3% of students of primary school educated mothers, 53.1% of selected students have adequate knowledge

of above primary education mothers, while 130 (46.0%) is inadequate. This table shows a significant relation between Students' level of knowledge and mother education ($p < 0.001$). Table 3 shows the relation between level of knowledge and academic performance. 82 (51.3%) students who had excellent academic performance had adequate MERS-CoV knowledge. On the other hand students who had very good, good, and poor academic performance had 45.8%, 21.5% and 20% adequate MERS-CoV knowledge respectively. This table shows a significant relation between level of knowledge and academic performance $p < 0.001$.

Table 4 shows the relation between students' attitude towards MERS-CoV and level of knowledge. 97(85.8%) of the students had poor attitude and poor knowledge while 16(14.2%) had poor attitude and good knowledge. On the other hand, 127 (46.5%) of the students had poor knowledge and good attitude while 146 (53.5%) had good attitude and good knowledge of MERS-CoV. This table shows a significant relation between students' attitude towards MERS-CoV and level of knowledge $p < 0.001$.

Table (1) Social characteristics of the sample (n=386)

Social characteristics	No.	%
Age:		
Younger than 17	127	33.0
17-18	226	58.5
Older than 18	33	8.5
Residence:		
Hawtah Sudair	209	54.1
Rawdat Sudair	71	18.4
Others	106	27.5
School level:		
1st year	152	39.4
2nd year	131	33.9
3rd year	103	26.7
Academic performance:		
Excellent	160	41.5
Very good	131	33.9
Good	65	16.8
Poor	30	7.8
Mother education:		
Primary	72	18.7
Intermediate/secondary	166	43.0
University and above	111	28.8
Illiterate	37	9.6
Father education:		
Primary	68	17.6
Intermediate/secondary	151	39.2
University and above	141	36.5
Illiterate	26	6.7
Family income:		
less than 5000 SR	104	26.9
5000 - 10000 SR	124	32.1
more than 10000 SR	158	40.9

**Fig (1) Level of knowledge of secondary students**

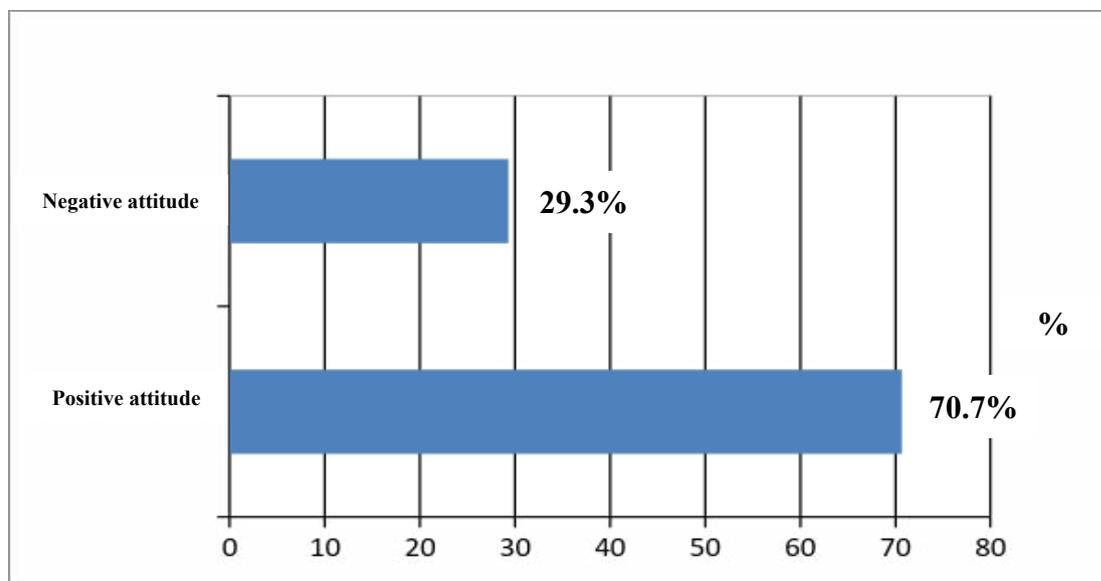


Fig (2) Attitude of the students towards MERS-CoV

Table (2) Relation between levels of Student' knowledge and mothers' education

Mother education	Level of knowledge		Total	P
	Adequate	Inadequate		
Illiterate	30 (81.1%)	7 (18.9%)	37 (9.6%)	<0.001
Primary education	47 (65.3%)	25 (34.7%)	72 (18.6%)	
Above primary education	147(53.1%)	130(46.9%)	277 (43.0%)	
Total	224 (58.0%)	162 (42.0%)	386 (100%)	

Table (3) Relation between level of knowledge and academic performance

Academic performance	Level of knowledge		Total	P
	Poor knowledge	Good knowledge		
Excellent (80% and above)	78 (48.8%)	82 (51.3%)	160 (100%)	<0.001
Very good (70%-79%)	71 (54.2%)	60 (45.8%)	131 (100%)	
Good (60%-69%)	51 (78.5%)	14 (21.5%)	65 (100%)	
Poor (Less than 60%)	24 (80%)	6 (20%)	30 (100%)	
Total	224 (58%)	162 (42%)	386 (100%)	

Table (4) Relation between attitude towards MERS-COV and level of knowledge

Level of attitude	Level of knowledge		Total	P
	Poor knowledge	Good knowledge		
Poor attitude	97(85.8%)	16(14.2%)	113(100.0%)	<0.001
Good attitude	127(46.5%)	146(53.5%)	273(100.0%)	
Total	224(58.0%)	162(42.0%)	386(100.0%)	

Discussion

This study was conducted in Sudair area, Saudi Arabia aiming at providing insight into knowledge and attitude of secondary school students about MERS-CoV. In general, our results showed the students had inadequate knowledge 58% but positive attitude 70.7 % towards MERS-CoV. Regarding knowledge, our results are consistent with a study conducted among female students at Qatar University.¹² Our findings are also consistent with a study conducted among medical students in the College of Medicine, King Saud Bin Abdul-Aziz University for Health Sciences in Riyadh, Saudi Arabia.¹³ Our findings also agree with a study conducted among colleges of King Saud University students. This study also included secondary schools in Riyadh for comparison. In this study no significant difference was observed between university and secondary school students in Riyadh.¹⁴ these

findings agree with recently published study at Makah among healthcare providers which reported poor knowledge of MERS-CoV.¹⁵ These findings may indicate the region is lack of awareness, published researches, and campaigns that increase awareness toward MERS-CoV.

Our findings regarding knowledge of MERS-CoV contradicts a study conducted in Qasim region that reported good knowledge of healthcare providers about the disease.⁴ Our findings also disagree with a study conducted in Jeddah among dental students which showed good knowledge of MERS-CoV.⁶ Studies conducted in Riyadh and different settings in Saudi Arabia among general public showed adequate knowledge and concern^{16,17}. Health authorities in Sudair area and university of Majmaah should increase their effort to increase the awareness toward MERS-CoV.

For attitude regarding MERS-CoV, our

findings agree with a study conducted in Qassim.³On the other hand our findings of good attitude contradict a study conducted in Makah which is presented very high negative attitude towards the disease.¹⁵ Attitude seems to be more important than knowledge, because attitude could prevent many diseases which are unnecessary to know them, by following the right preventive methods.

The study showed that the students' level of knowledge regarding MERS-CoV increases as the mothers' education increases; this finding showed a significant association ($p=0.006$).The results showed that there is a significant association between students' level of knowledge regarding MERS-CoV and mothers' education ($p <0.001$), the students' level of knowledge regarding MERS-CoV increases as the mothers' level of education increases. These findings may reflect the importance of educating parents in order to combat MERS-CoV. Our findings showed that the students who had poor knowledge had also poor attitude towards MERS-CoV and those who had good knowledge had positive attitude towards the disease. This association is significant ($p<0.001$).

The main source of knowledge of the students regarding MERS-CoV, according to our study, is the media. This finding is in agreement with other studies conducted in Saudi Arabia.^{15,4} Other study showed that television and colleagues are the most important source^{12,6}

Conclusion

The study concluded that the secondary students' knowledge of MERS-CoV in Sudair area, Saudi Arabia is inadequate. However, most of the students have positive attitude towards the disease. The students' MERS-CoV knowledge is significantly associated with parents' education. The students' attitude towards MERS-CoV is significantly associated with the disease knowledge. The main source of information regarding MERS-CoV is the media.

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References

1. WHO. WHO guidelines for investigation of cases of human infection with Middle East Respiratory Syndrome Corona virus (MERS-CoV). July 2013. <http://www.who.int/mediacentre/factsheets/mers-cov/en/> (accessed on 18/10/2015).
2. CDC. first Confirmed Cases of Middle East Respiratory Syndrome Corona virus (MERS-CoV) Infection in the United States, Updated Information on the Epidemiology of MERS-CoV Infection, and Guidance for the Public, Clinicians, and Public Health Authorities May 2014. From: <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6319a4.htm>. (Accessed on 3/11/2016)
3. Arabi YM, Arifi AA, Balkhy HH, Najm H, Aldawood AS, Ghabashi A, et al. Clinical course and outcomes of critically ill patients with Middle East respiratory syndrome corona virus infection. *Ann Intern Med*. 2014 Mar 18; 160(6):389-97.
4. Khan MU ,Shah S , Ahmed A, Fatokun O. Knowledge and attitude of healthcare workers about middle east respiratory syndrome in multispecialty hospitals of Qassim, Saudi Arabia.*BMC Public Health* 2014, 14:1281
5. Memish ZA, Zumla A. Severe acute respiratory syndrome vs. the Middle East respiratory syndrome. *Curr Opin Pulm Med*. 2014; 20(3):233-41. Doi: 10.1097/MCP.00000000000000
6. Kharma M Y, Alalwani M S, Amer M F, Tarakji B, AwsG. Assessment of the awareness level of dental students toward Middle East Respiratory Syndrome-corona virus. *J Int Soc Prev Community Dent*. 2015 May-Jun; 5(3): 163–169
7. Hans Schweisfruth. Review Article: Middle East Respiratory Syndrome – Corona virus (MERS-CoV). *Global J. Pathol. Microbiol*. 2014:37.
8. Kim OJ, Lee DH, Lee CH. Close relationship between SARS-corona virus and Group 2 corona virus. *J Microbiol*. 2006 Feb;44(1):83-91.
9. Matthew Cotten, Simon J. Watson, et al. Spread, Circulation, and Evolution of the Middle East Respiratory Syndrome Corona virus. *mbio* . 2014.
10. McIntosh K. Middle East respiratory syndrome corona virus: Virology and epidemiology. Up to date. Apr 14, 2016. <http://www.uptodate.com/contents/middle-east-respiratory-syndrome-coronavirus-virology-and-epidemiology#H15168486>. accessed on (6/5/2016).
11. Alghamdi IG, HussainII, Almalki SS. The pattern of Middle East respiratory syndrome corona virus in Saudi Arabia: a descriptive epidemiological analysis of data from the Saudi Ministry of Health. *International Journal of General Medicine*. 2014

12. Al-Muhafda Z, Qaher M, Faisal E, Abu Shahla H, Kurdi R, Al-Jayyousi G. Knowledge of MERS-Corona Virus among female students at Qatar University. Qatar Foundation Annual Research Conference 201: HBSP 3348
13. Al-Mohrej A, Agha S. Are Saudi medical students aware of Middle East respiratory syndrome corona virus during an outbreak? J Infect Public Health 2016. <http://dx.doi.org/10.1016/j.jiph.2016.06.013>
14. Al-Hazmi A, Gosadi I, SomilyAlsubaie S, Saeed A, Knowledge, attitude and Practice of secondary schools and university students toward Middle East Respiratory Syndrome epidemic in Saudi Arabia: a cross-sectional study, Saudi Journal of Biological Sciences (2016). Doi: <http://dx.doi.org/10.1016/j.sjbs.2016.01.032>
15. Nour MO, Babilghith AO, Natto HA, Al-Amin FO, Alawneh SM. Knowledge, attitude and practices of healthcare providers towards MERS-CoV infection at Makkah hospitals, KSA. International Research Journal of Medicine and Medical Sciences, 2015; 3(4): 103-112.
16. Almutairi KM, Al Helih EM, Moussa M, Boshaiqah AE, Saleh Alajilan A, Vinluan JM, et al. Awareness, Attitudes, and Practices Related to Corona virus Pandemic Among Public in Saudi Arabia. Community Health 2015 Oct-Dec; 38(4):332-40. Doi: 10.1097/FCH.0000000000000082.
17. Alqahtani SHM and Aldawsari MNR. The attitudes and degree of awareness about MERS-CoV among Saudis of different ages; Open Access Text (OAT) Doi: 10.15761/CRT.1000114. From: <http://www.oatext.com/The-attitudes-and-degree-of-awareness-about-MERS-CoV-among-Saudis-of-different-ages.php>

Original Article

Medical undergraduates' feedback towards Problem-based learning (PBL): College of Medicine, Majmaah University, Saudi Arabia

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Abstract:

Background: An integrated outcome based curriculum is defined as the curriculum that is based on predefined exit outcomes which students need to display at the end of the course. The Problem-based learning (PBL) was developed in 1968 at McMaster University as one of the student centred teaching modality promoting self-directed and lifelong learning. The college of medicine, Majmaah University, was started in 2010 with integrated, outcome based hybrid curriculum.

Objectives: The objective of the study was to assess the perception and feedback of medical students, Majmaah University towards problem-based learning (PBL)

Materials and Methods: The current study was cross-sectional. The study population consisted of all medical undergraduates (Year 1, 2 and 3) studying in college of medicine,

المخلص

مقدمة: يتم تعريف المنهج المبني على المخرجات على أنه المنهج الذي يتم تنظيمه على أساس الخروج بمخرجات تعليمية محددة مسبقا والتي يحتاج الطلاب لإتقانها مع نهاية البرنامج التعليمي. نشأت فكرة التعليم المبني على حل المشكلات في العام ١٩٦٨ في جامعة ماكماستر باعتبارها واحدة من الجامعات التي تطرح تعليما يجعل الطالب مركزا للعملية التعليمية والتي تحفز التوجيه الذاتي في التعلم وسياسة التعلم مدى الحياة. وقد بدأت كلية الطب بجامعة المجمعة في عام ٢٠١٠ بمنهج تكاملي مبني على المخرجات.

تهدف هذه الدراسة الى تقييم التصور ومقارنة ردود فعل الطلاب من السنوات الدراسية المختلفة عن التعليم المبني على حل المشكلات باعتبارها واحدة من طرق التدريس والتعلم في المقررات الدراسية التي تُطرح في المرحلة الثانية (السنوات الأساسية) من منهج كلية الطب.

طريقة البحث: تم تصميم البحث بطريقة «الدراسة القطعية». تألف مجتمع الدراسة من جميع طلاب المرحلة الدراسية (السنة الأولى والثانية والثالثة) الذين يدرسون في كلية الطب بجامعة المجمعة. تم استخدام استبيان ذاتي مبني على أساليب

Majmaah University. A self-administered questionnaire on VARK (visual, auditory, reader and kinesthetic) learning styles and learning theories on a five point Likert rating scale was used.

Results: Sixty two students (54.2%) agreed that problem-based learning (PBL) is a reliable tool for facilitating visual/spatial learning. Around 75% of students strongly agreed that PBL is a reliable tool for facilitating auditory learning. Ninety-nine (88.1%) students stated that PBL facilitates in developing interpersonal skills. Eighty two (72.4%) students perceived that PBL helped in developing the skills of problem solving, decision taking and practical application of ideas. No significant association was observed between year-wise analysis and perception of students for various PBL questions ($p > 0.05$).

Conclusion- The Problem-based learning (PBL) is a teaching and learning tool that caters to variety of learning styles and helps in developing vital skills that are necessary to form a good doctor.

Key words: Outcome-based curriculum, Problem-based learning, Visual learning, auditory learning, problem solving, medical undergraduate students

التعلم VARK (البصري والسمعي والمقروء والحركي) ونظريات التعلم على مقياس (Likert) من خمس نقاط.

النتائج: التعليم المبني على حل المشكلات هي أداة موثوقة لتسهيل التعلم البصري / المكاني، وافق غالبية الطلاب عليها ٦٢ (٥٤,٢٪). وقد وافق حوالي ٧٥٪ من الطلاب بشدة على أن التعليم المبني على حل المشكلات هو أداة موثوقة لتيسير التعلم السمعي. أجاب ٩٩ (٨٨,١٪) من الطلاب بأن التعليم المبني على حل المشكلات ساهم في تطوير مهارات التعامل مع الآخرين. اعتبر ٨٢ (٧٢,٤٪) من الطلاب أن هذه الطريقة ساعدت في تطوير مهارات حل المشكلات واتخاذ القرارات والتطبيق العملي للأفكار. لم يُلاحظ وجود ارتباط كبير بين ردود فعل الطلاب من مختلف الأعوام وتصورهم في مختلف الأسئلة عن التعليم المبني على حل المشكلات. ($p > 0.05$)

الاستنتاج: التعليم المبني على حل المشكلات هو أداة تعليمية تحتوي على مجموعة متنوعة من أساليب التعلم وتساعد في تطوير المهارات الحيوية التي هي ضرورية لتخريج طبيب جيد.

Introduction:

During 1980, it was perceived that amount of knowledge relevant for medical undergraduate is getting too much⁽¹⁾. The General Medical Council, UK further stated that tomorrow doctors would probably apply the skills and knowledge that cannot be predicted in their

present learning scenario⁽²⁾. In the last two decades, a shift has been noticed in medical curriculum from the traditional subject based approach towards integrated, system based curricula⁽³⁾. A more holistic definition appears for the curriculum that includes programme objectives, teaching and learning methods and educational strategies⁽⁴⁾. The problem-

based learning was introduced as one of the student-centered teaching and learning methods by McMaster University, Canada in 1960s⁽⁵⁾. As mentioned earlier by Harden, the outcome-based education (OBE) is a sophisticated strategy for curriculum planning that offers a number of advantages. The two basic requirements of OBE are explicitly stated learning outcome and all the decisions of the learning outcome should be based on these outcomes. An integrated curriculum denotes a teaching strategy in which the content is derived from different subjects or specialties and focuses on a certain theme or topic or module. The PBL is an instructional method that challenges the learner to “learn to learn,” by working cooperatively in small groups to solve real world problems⁽⁶⁾. According to Albanese, several theories advocate the rationale behind the PBL, some of these theories are information processing theory, cooperative learning theories, self-determination theory and control theory⁽⁷⁾. In medical education, the PBL may be used as a curriculum design or just a teaching learning methodology.

A study has been conducted in College of Medicine; King Saud University regarding the perceptions of the medical undergraduates towards Problem based learning in an outcome-based curriculum, the study showed the important role of PBL in a system-based curriculum, which showed the importance of PBL as a different learning, student-based skills. Students reported that the PBL sessions promote students' knowledge and motivation.

They also reported that the sessions contribute to the development of interpersonal, communication, and presentation skills⁽⁸⁾.

Material and Method:

This cross-sectional study was done at College of Medicine, Majmaah University, Saudi Arabia from November 2013 to April 2014 and is comprised of 1st, 2nd, and 3rd year medical students. The College of Medicine, Majmaah University was started in 2010 as one of the newly established colleges in Saudi Arabia. It adopted an integrated outcome-based curriculum. Here the various specialties of medical sciences are integrated in the form of different modules that are taken through several semesters. A mix of teaching and learning methodologies are used and problem based learning (PBL) is one of them used in Phase II of the curriculum. The phase II is of two and half year's duration consist of system-based modules mainly comprised of basic medical science subjects along with pathology, microbiology, biochemistry with thirty percent blend of clinical subjects. The total number of the students enrolled in year 1, 2 and 3 were 133. All students were included in this study by using complete enumeration sampling technique. Ethical approval was obtained from Majmaah University Ethics Committee.

A self-administered questionnaire based on the VARK learning styles and learning theories on five-point Likert rating scale was used. The questionnaire included the perception of students regarding facilitating visual,

auditory, kinesthetic learning and reading and writing skills by PBL. The questionnaire also included questions about perceptions of the students regarding achieving of vertical integration, horizontal integration, providing peer feedback and stimulation of deep learning by PBL as teaching and learning method. The reliability of the questionnaire was checked by Cronbach's Alpha with a split-half method. The data were analyzed using SPSS 22.0. Mean±S.D was reported for quantitative variables. Frequencies and percentages were reported for qualitative variables. One way Analysis of Variance (ANOVA) was applied to compare mean score with years; post hoc Turkey's test was applied to observe which group mean differs. Pearson Chi-square and Fisher Exact tests were applied to observe associations between qualitative variables. A p-value of <0.05 was considered as statistically significant.

Results:

Majority of the students belonged to studying year 1 (n=48, 42.9%), almost one quarter students were studying in year 2 and (n=24, 21.4%) were studying in year 3. When asked about "*Is problem based learning is a reliable tool for facilitating visual/spatial learning*" majority of the students disagreed to it (n=38, 33.9%), twenty-seven students were uncertain in their opinion (n=27, 24%), twenty-three (20.5%) strongly agreed to it, seventeen students (12.5%) agreed and a small percentage (n=03, 3.5%) strongly agreed. When this item was associated with

years of study, no significant association was observed (p=0.699). "*Problem based learning is a reliable tool for facilitating auditory learning*" more than half of the students agreed to it (n=60, 53.6%), one quarter students (n=29, 25.9%) strongly agreed, twenty-one (18.8%) were uncertain in their opinion and a small percentage (n=01, 0.9%) disagreed and strongly disagreed respectively. When this item was associated with years of study, no significant association was observed (p=0.166). "*Problem based learning is a reliable tool for facilitating kinesthetic learning*" majority of the students strongly disagreed to it (n=35, 31.3%), twenty-seven (24%) disagreed, nine (8%) were uncertain in their opinion, (n=24, 21.4%) students agreed to it and only (n=15, 13%) strongly agreed. When this item was associated with years of study, no significant association was observed (p=0.696). "*Problem based learning is a reliable tool for developing reading and writing skills*" majority of the students agreed to it (n=52, 46.4%), one quarter of students (n=38, 33.9%) strongly agreed, fifteen (13.4%) were uncertain in their opinion and a small percentage (n=5, 4.5%) students disagreed and strongly disagreed respectively. When this item was associated with years of study, no significant association was observed (p=0.342). "*Problem based learning helped in developing verbal/linguistic skills and self-confidence*" majority of the students strongly agreed to it (n=63, 56.3%), almost one quarter students (n=40, 35.7%) agreed and (n=09, 8.0%) were uncertain in their

opinion. When this item was associated with years of study, no significant association was observed ($p=0.604$). *“Problem based learning facilitates in developing interpersonal skills”* majority of the students strongly agreed to it ($n=61, 54.5\%$), one quarter students ($n=38, 33.9\%$) agreed and ($n=13, 11.6\%$) were uncertain in their opinion. When this item was associated with years of study, no significant association was observed ($p=0.378$).

“Problem based learning stimulates deep learning” majority of the students strongly agreed to it ($n=48, 42.9\%$), more than one quarter of students ($n=40, 35.7\%$) agreed, seventeen (15.2%) were uncertain in their opinion and a small percentage of students ($n=6, 1; 5.4, 0.9\%$) disagreed and strongly disagreed respectively. When this item was associated with years of study, no significant association was observed ($p=0.054$). *“Problem based learning helped in achieving curriculum outcomes”* majority of the students agreed to it ($n=44, 39.3\%$), twenty-nine (37.5%) strongly agreed, thirty one (27.7%) were uncertain in their opinion and a small percentage of students ($n=7, 1; 6.3, 0.9\%$) disagreed and strongly disagreed respectively. When this item was associated with years of study, no significant association was observed ($p=0.495$).

“Problem based learning fulfills vertical integration i.e., basic medical sciences efficiently integrated with clinical sciences” majority of the students agreed to it ($n=43, 38.4\%$), more than one quarter students

($n=41, 36.6\%$) were uncertain in their opinion, ($n=25, 22.3\%$) strongly agreed and a small percentage of students ($n=3, 2.7\%$) disagreed to it. When this item was associated with years of study, no significant association was observed ($p=0.259$). *“Problem based learning fulfills horizontal integration i.e., integration between different subjects of basic medical sciences”* majority of the students agreed to it ($n=48, 42.9\%$), almost one quarter students ($n=36, 32.1\%$) strongly agreed, twenty-six (23.2%) were uncertain in their opinion and a small percentage of students ($n=2, 1.8\%$) disagreed to it. When this item was associated with years of study, no significant association was observed ($p=0.634$). *“Problem based learning provided the opportunity of peer teaching and peer feedback”* almost 50% students agreed to it, one quarter students ($n=41, 36.6\%$) strongly agreed, fifteen (13.4%) were uncertain in their opinion and a small percentage of students ($n=2, 1.8\%$) disagreed to it. When this item was associated with years of study, no significant association was observed ($p=0.355$).

“Receiving of the feedback, during the problem based learning sessions modified your attitude towards learning” majority of the students agreed to it ($n=41, 36.6\%$), one quarter students were uncertain in their opinion ($n=38, 33.9\%$), twenty-eight (25.0%) strongly agreed and a small percentage of students ($n=5, 4.5\%$) disagreed to it. When this item was associated with years of study, no significant association was observed ($p=0.187$). *“Problem based learning*

developed skills like problem solving, taking decisions and practical application of ideas” majority of the students agreed to it (n=42, 37.5%), forty (35.7%) strongly agreed, twenty-six (23.2%) were uncertain in opinion and a small percentage of students (n=4, 3.6%) disagreed to it. When this item was associated with years of study, no significant association was observed (p=0.077). “Problem based learning promotes self-directed learning” equal number of students strongly agreed and agreed to the statement (n=46, 41.1%) respectively, fifteen (13.4%) strongly agreed, fifteen (13.4%) were uncertain in their opinion and a small percentage of students (n=4, 1;

3.6, 0.9%) students disagreed and strongly disagreed to it. When this item was associated with years of study, no significant association was observed (p=0.359) (table I).

Moreover, mean scores were calculated for all the responses of students. Significant difference was observed between years of study and mean response scores. Perception and attitude of year 1 students differed significantly with year 2 & year 3 students (p=0.040) (table II).

Table 1: Year wise associations with perception & attitude of students

Items	Years			Items	Years		
	1 n(%) N = 48	2 n(%) N = 40	3 n(%) N = 24		1 n(%) N = 48	2 n(%) N = 40	3 n(%) N = 24
PBL is a reliable tool for facilitating visual / spatial learning:				PBL stimulates deep learning:			
Strongly Disagree	11 (22.9)	06 (15.0)	09 (37.5)	Strongly Disagree	01 (2.10)	00 (0.00)	00 (0.00)
Disagree	17 (35.4)	16 (40.0)	05 (20.8)	Disagree	05 (12.4)	01 (2.50)	00 (0.00)
Neutral	06 (12.5)	15 (37.5)	06 (25.0)	Neutral	12 (25.0)	03 (7.50)	02 (8.30)
Agree	13 (27.1)	00 (0.00)	04 (16.7)	Agree	14 (29.2)	14 (35.0)	12 (50.0)
Strongly Agree	01 (2.10)	03 (7.50)	00 (0.00)	Strongly Agree	16 (33.3)	22 (55.0)	10 (41.7)
	p-value =0.514				p-value =0.054		
PBL is a reliable tool for facilitating auditory learning?				PBL helped in achieving curriculum outcomes:			
Strongly Disagree	00 (0.00)	00 (0.00)	01 (4.20)	Strongly Disagree	00 (0.00)	01 (2.50)	00 (0.00)
Disagree	01 (2.10)	00 (0.00)	00 (0.00)	Disagree	06 (12.5)	01 (2.50)	00 (0.00)
Neutral	10 (20.8)	09 (22.5)	02 (8.30)	Neutral	14 (29.2)	10 (25.0)	07 (29.2)
Agree	26 (54.2)	17 (42.5)	17 (70.8)	Agree	16 (33.3)	18 (45.0)	10 (41.7)
Strongly Agree	11 (22.9)	14 (35.0)	04 (16.7)	Strongly agree	12 (25.0)	10 (25.0)	07 (29.2)
	p-value =0.166				p-value =0.495		
PBL is a reliable tool for facilitating kinesthetic learning:				PBL fulfills vertical integration:			
Strongly Disagree	14 (29.2)	12 (30.0)	09 (37.5)	Strongly Disagree	00 (0.00)	00 (0.00)	00 (0.00)
Disagree	14 (29.2)	10 (25.0)	05 (20.8)	Disagree	02 (4.20)	01 (2.50)	00 (0.00)
Neutral	04 (8.30)	03 (7.50)	02 (8.30)	Neutral	22 (45.8)	13 (32.5)	06 (25.0)
Agree	13 (27.1)	07 (17.5)	04 (17.7)	Agree	15 (31.3)	19 (47.5)	09 (37.5)
Strongly Agree	03 (6.30)	08 (20.0)	04 (16.7)	Strongly Agree	09 (18.8)	07 (17.5)	09 (37.5)
	p-value =0.773				p-value =0.259		

PBL is a reliable tool for developing reading and writing skills:				PBL fulfills horizontal integration:			
Strongly Disagree	01 (2.10)	01 (2.50)	00 (0.00)	Strongly Disagree	00 (0.00)	00 (0.00)	00 (0.00)
Disagree	05 (10.4)	00 (0.00)	00 (0.00)	Disagree	01 (2.10)	01 (2.50)	00 (0.00)
Neutral	05 (10.4)	06 (15.0)	04 (16.7)	Neutral	15 (31.3)	08 (20.0)	03 (12.5)
Agree	21 (43.8)	17 (42.5)	14 (58.3)	Agree	18 (37.5)	18 (45.0)	12 (50.0)
Strongly Agree	16 (33.3)	16 (40.0)	06 (25.0)	Strongly Agree	14 (29.2)	13 (32.5)	09 (37.5)
	p-value = 0.342				p-value = 0.634		
PBL helped in developing verbal/ linguistic skills and self-confidence:				PBL provided the opportunity of peer teaching and peer feedback:			
Strongly Disagree	00 (0.00)	00 (0.00)	00 (0.00)	Strongly Disagree	00 (0.00)	00 (0.00)	00 (0.00)
Disagree	00 (0.00)	00 (0.00)	00 (0.00)	Disagree	02 (4.20)	00 (0.00)	00 (0.00)
Neutral	06 (12.5)	02 (5.00)	01 (4.20)	Neutral	09 (18.8)	02 (5.0)	04 (16.7)
Agree	14 (29.2)	16 (40.0)	10 (41.7)	Agree	21 (43.8)	22 (55.0)	11 (45.8)
Strongly Agree	28 (58.3)	22 (55.0)	03 (54.2)	Strongly Agree	16 (33.3)	16 (40.0)	09 (37.5)
	p-value =0.604				p-value =0.355		
PBL facilitates in developing interpersonal skills:				Receiving feedback, during the PBL sessions modifies your attitude towards learning:			
Strongly Disagree	00 (0.00)	00 (0.00)	00 (0.00)	Strongly Disagree	00 (0.00)	00 (0.00)	00 (0.00)
Disagree	00 (0.00)	00 (0.00)	00 (0.00)	Disagree	05 (10.4)	00 (0.00)	00 (0.00)
Neutral	08 (16.7)	02 (5.00)	03 (12.5)	Neutral	18 (37.5)	11 (27.5)	09 (37.5)
Agree	17 (35.4)	12 (30.0)	09 (37.5)	Agree	13 (27.1)	19 (47.5)	09 (37.5)
Strongly Agree	23 (47.9)	26(65.0)	12 (50.0)	Strongly Agree	12 (25.0)	10 (25.0)	06 (25.0)
	p-value =0.378				p-value =0.187		

Table (2)

Comparison of Mean Score – students' responses on 14 items:

	Year 1 Mean \pm S.D n=48	Year 2 Mean \pm S.D n=40	Year 3 Mean \pm S.D n=24	p-value
Mean Scores	2.85 \pm 0.60	3.09 \pm 0.42**	3.12 \pm 0.35**	0.040*

*statistically significant at 5% level of significance

**LSD significant multiple comparisons (year 1 with year 2&3)

Discussion:

The students in a medical school are adult learners and PBL is an appropriate teaching learning methodology for such learners. In this study, we studied perception of medical students about various aspects of PBL.

The Problem based learning is based on information processing theory, where the new knowledge is constructed upon the existing knowledge and it is itself derived from the constructivist educational theory [9]. Studies have shown that there is a difference in

students' perception about PBL in a traditional curriculum where it is adopted as a new learning methodology and a curriculum where PBL is included from the beginning [10]. This study showed that majority of the students in all three years responded that PBL facilitates auditory learning with read and write. As discussed in results, PBL as teaching and learning method is a valid tool for facilitating auditory learning, around 25.9 % of students strongly agreed and 53.6 % agreed to it. For developing reading and writing skills, 33.9% students strongly agreed and 46.4 % agreed, PBL as reliable tool. On the part of facilitating kinesthetic learning, 31.3% students strongly disagreed, 24% students disagreed that it would be achieved by PBL. For the facilitation of visual and spatial learning by PBL, around 38% students strongly disagreed and 20.5% disagreed. Our finding is supported by the study of Alkhasawneh et al. (2008) which showed that there was increase in VARK score post-test after PBL than pre-test. Each session of PBL involves a discussion among the group members so auditory learning is facilitated. Between the sessions of PBL the students have to go through lot of text

material in order to cover the learning objectives, this has a role in facilitation of read/write learning. The visual learning can be enhanced in PBL sessions by the inclusion of pictures, diagrams etc. in the case scenario or the using concept maps for achieving learning objectives. As Hsu cited the use of concept maps in discussion part of PBL and has reported it as quite beneficial. Similarly kinesthetic learning can be facilitated by applying role-play, demonstration etc. in the given problem or learning objective [10].

This study shows that the students perceive positive impact of PBL on self-development like self-confidence and interpersonal skills. Most students (56.3%) strongly agreed and 35.7% agreed to the statement that PBL helped in developing verbal/linguistic skills and self-confidence. Similarly, 54.9% students strongly agreed and 33.9% agreed that PBL facilitates in development of interpersonal skills. These findings are consistent with Stokes et al. (1997); he reported that interpersonal, leadership and metacognitive skills were required during the PBL experience. Creativity, teamwork, self-management, communication and problem-solving skills were also enhanced. Huang in

his study reported that 80% of the students perceived that PBL was more interactive than their own learning style [12]. Dochy et al [13] referred seven classical steps of solving PBL, in which only step six supports individual activity while all other steps are collaborative activities with focus on sharing of knowledge.

Our study shows that PBL has significantly positive effect on learning behavior like deep learning, advantage of multiple feedback and positive modification of attitude towards leaning. 36.6% students strongly agreed while about 50% of them agreed to the perception that PBL provides opportunity for peer teaching and peer feedback; and 25.0% students strongly agreed while 36.6% agreed that PBL modified their attitude towards learning, this finding is consistent with Chung and Chow reported that the students' perceived that PBL helped them develop the self-evaluation skills [14]. Kilroy stated that the PBL learning clinical reasoning process and self-directed learning skills. He further stated that PBL increases the self-motivation in students by helping them identifying their learning needs [9]. Dochy et al stated that PBL was developed in order to instill in

students the skills of professionalism such as problem solving, analysis, synthesis and evaluation [13].

Development of deeper understanding is one of the key features of Problem based learning [15]. A review conducted by Azer [16] showed that usage of multiple resources such lectures, basic medical sciences museum, practical's, web based programmes, students seminars etc. as learning resource for PBL sessions would facilitate in building in depth understanding of complex concepts. The findings of this study showed similar results that around 43% students strongly agreed and 36 % agreed on stimulation of deep learning by Problem based learning. In our settings, the students are using multiple resources for PBL sessions. It was suggested that a well-aligned learning resource facilitates deep learning in PBL session [17].

In our study, it was found that 40 % students strongly agreed and 38 % students agree for achieving curriculum outcomes by using Problem based learning as teaching and learning method. Studies showed that learning environment plays important role for achieving high quality learning outcomes

by any teaching and learning method [18]. Study conducted by Ruiz-Gallardo et al. [19] reported positive correlation between students' performance and Problem based learning as teaching and learning tool. The focus for the integration is stressed from long time in medical education and integrated curricula are widely implemented world wide in medical education [20]. The integration of the disciplines of same level is termed as horizontal integration such as integrating biochemistry, anatomy and physiology in initial years of medical schools [21]. Our study showed that 32% strongly agreed and 43% agreed that PBL session facilitates horizontal integration. Hasan stressed that using well designed PBL in system-based modules would facilitate horizontal integration [22]. AMEE guide number 96 stressed that key role of integration is to remove the barrier between basic medical sciences and clinical sciences i.e., to facilitate the process of vertical integration [20]. The results of this study reflects 38% strongly agreed and 37 % agreed that Problem based learning facilitates vertical integration. The college of Medicine, Majmaah applied spiral curricula that reflect

both horizontal and vertical integration. Several studies (Schelton and Smidt, 1998) have suggested that students perceive that PBL helps them integrate theory and practice in a better way [23, 24, and 25]. Comparing mean score of students' responses gave a p value of 0.040.

Limitations:

First, this study has small number of the sample because only three batches were available during the study period. With due time, more number of batches will be available who have finished or attended Phase II of the curriculum. Second, only male students were included in our study, as female college was not started at that time.

Conclusion:

The study concluded that PBL helps in increasing students' self-confidence and interpersonal skills. Positive perception about PBL for learning behavior showed that PBL sessions help the students to become lifelong learners. The positive impact of PBL on curriculum strategies will encourage the administrators and the educators that their efforts are in the right direction. The result of this study shows that PBL facilitates all

learning modes although visual and kinesthetic modes do not have much encouraging trend. The visual learners can be facilitated by including diagrams and charts in the problem scenario and concept maps, flow charts for discussion session. Similarly bringing models and specimens for anatomy, physiology and pathology can facilitate the kinesthetic learning. Usage of role-play as problem scenario and its demonstration for framing learning objectives will be appropriate maneuver for promoting kinesthetic learning.

References:

1. Bergman, E. M., Sieben, J. M., Smailbegovic, I., de Bruin, A. B., Scherpbier, A. J., & van der Vleuten, C. P. (2013). Constructive, collaborative, contextual, and self-directed learning in surface anatomy education. *Anatomical sciences education*, 6(2), 114-124.
2. General Medical Council. Tomorrow's doctors. Report of the Educational Committee. 1993; London: GMC. 1-28.
3. Ling YU, Swanson DB, Holtzman K, Bucak SD. Retention of basic science information by senior medical students. *Academic Medicine*. 2008 Oct 1;83(10):S82-5.
4. Harden, JR Crosby, MH Davis, M. Friedman RM. AMEE Guide No. 14: Outcome-based education: Part 5-From competency to meta-competency: a model for the specification of learning outcomes. *Medical teacher*. 1999 Jan 1; 21(6):546-52.
5. McKimm J. Current trends in undergraduate medical education: program and curriculum design. *Samoa Medical Journal*. 2010; 1(2):40-8.
6. Duch BJ, Groh SE, Allen DE. The power of problem-based learning: a practical "how to" for teaching undergraduate courses in any discipline. Stylus Publishing, LLC. 2001.
7. Albanese M. Problem-based learning: why curricula are likely to show little effect on knowledge and clinical skills. *Medical education*. 2000 Sep 1; 34(9):729-38.
8. Al-Drees AA, Khalil MS, Irshad M, Abdulghani HM. Students' perception towards the problem based learning tutorial session in a system-based hybrid curriculum. *Saudi medical journal*. 2015;36(3):341.
9. Kilroy DA. Problem based learning. *Emergency medicine journal*. 2004 Jul 1;21(4):411-3.
10. Sim Heng Chye, M., Wee Keng Neo, L., & Da Silva, G. Student evaluation of the subject under problem-based learning mode: The case of practice of entrepreneurship. Paper presented at the Second Asia-Pacific Conference on Problem-Based Learning, Singapore, 2000, June.
11. Hsu LL. Developing concept maps from problem-based learning scenario discussions. *Journal of Advanced Nursing*.

- 2004 Dec 1;48(5):510-8.
12. Huang R. Chinese international students' perceptions of the problem-based learning experience. *Journal of Hospitality, Leisure, Sport and Tourism Education*. 2005;4(2):36-43.
 13. Dochy F, Segers M, Van Den Bossche P, Struyven K. Students' perceptions of a problem-based learning environment. *Learning environments research*. 2005 Jan 1; 8(1):41-66.
 14. Chung JC, Chow SM. Imbedded PBL in an Asian context: Opportunities and challenges. In *Proceedings of the 1st Asia-Pacific Conference on Problem-Based Learning 1999* (pp. 9-11).
 15. Wood SJ, Woywodt A, Pugh M, Sampson I, Madhavi P. Twelve tips to revitalise problem-based learning. *Medical teacher*. 2015 Aug 3;37(8):723-9.
 16. Azer SA. Introducing a problem-based learning program: 12 tips for success. *Medical teacher*. 2011 Oct 1; 33(10):808-13.
 17. Taylor D, Mifflin B. Problem-based learning: where are we now? *Medical teacher*. 2008 Jan 1;30(8):742-63.
 18. Kember D, Leung DY. Characterising a teaching and learning environment conducive to making demands on students while not making their workload excessive. *Studies in Higher Education*. 2006 Apr 1;31(2):185-98.
 19. Ruiz-Gallardo JR, Castaño S, Gómez-Alday JJ, Valdés A. Assessing student workload in Problem Based Learning: Relationships among teaching method, student workload and achievement. A case study in Natural Sciences. *Teaching and Teacher Education*. 2011 Apr 30;27(3):619-27.
 20. Brauer DG, Ferguson KJ. The integrated curriculum in medical education: AMEE Guide No. 96. *Medical teacher*. 2015 Apr 3;37(4):312-22.
 21. Lie N. Traditional and non-traditional curricula. Definitions and terminology. *Tidsskrift for den Norske laegeforening: tidsskrift for praktisk medicin, ny raekke*. 1995 Mar;115(9):1067-71.
 22. Hassan S. Concepts of vertical and horizontal integration as an approach to integrated curriculum. *Education in Medicine Journal*. 2013 Jan 12;5(4).
 23. Lo A. Developing quality students for the hospitality and tourism industries through problem-based learning. *Conference Proceedings of Hospitality, Tourism and Food service Industry in Asia: development, marketing and sustainability 2004 May 27-29, Phuket*.
 24. Martin KJ, Chrispeels JH, D'Emidio-Caston M. Exploring the use of problem-based learning for developing collaborative leadership skills. *Journal of School Leadership*. 1998 Sep 1; 8:470-500.
 25. Shelton JB, Smith RF. Problem-based learning in analytical science undergraduate teaching. *Research in Science & Technological Education*. 1998 May 1;16(1):19-29.

Review Article

Neurodynamics and mobilization in Stroke Rehabilitation– A Systematic Review

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Abstract:

Background

Stroke patients have residual impairments which results in disability. Being an upper motor neuron lesion the status of peripheral neural tension is not clearly studied thus far.

Objectives

The primary aim of the review was to establish whether there is clear understanding about the status of peripheral neural mechanics following stroke and Secondary aim of the study was to analyze the contribution of neural mobilization techniques as an intervention tool in stroke recovery

Strategy

The researcher searched the Cochrane Stroke Group Trials Register. In addition, the following electronic databases were explored: Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, EMBASE, CINAHL, Web of Science Proceeding, Science Citation Index Expanded, Physiotherapy Evidence Database (Pedro), REHAB-DATA and Google Scholar. The reviewer had searched relevant journals and conference proceedings and screened reference lists. To identify if there were any unpublished and ongoing trials a search on trials directories were

المخلص

خلفية البحث

هناك بعض الإعاقات المتبقية لمرضى السكتة الدماغية تؤدي إلى العجز. كون المحرك الرئيسي هي الخلايا العصبية إلا أن حالة التوتر العصبي الطرفي ليست مدروسة بشكل واضح حتى الآن.

الاهداف

إن الهدف الرئيسي من البحث هو تحديد ما إذا كان هناك فهم واضح لحالة الميكانيكا العصبية الطرفية بعد السكتة الدماغية والهدف الثانوي للدراسة هو تحليل مساهمة تقنيات الحركة العصبية كوسيلة تدخل في علاج السكتة الدماغية.

استراتيجية البحث

قام الباحث بدراسة سجل تجارب السكتة الدماغية لمجموعة كوكران. بالإضافة إلى استكشاف قواعد البيانات الإلكترونية

التالية: سجل كوكران المركزي للتجارب الخاضعة للرقابة العلمية، وشبكة الاجراءات العلمية وفهرس الاستدلالات العلمية الموسعة وقاعدة بيانات العلاج الطبيعي ومحرك البحث جوجل. كما وقام الباحث بمراجعة المجالات المتعلقة بالموضوع ونتائج المؤتمرات وفرز القوائم المرجعية. وذلك لتحديد ما إذا كانت هناك أي تجارب جارية أو غير منشورة تبحث في الأدلة الموجودة.

معايير الاختيار

شملت الدراسات ما إذا كان هناك محاولة أجريت باستخدام اجراء اختبار التوتر العصبي وتقنيه الحركة العصبية لتحسين حالة مريض السكتة الدماغية.

جمع البيانات وتحليلها

تم استخراج البيانات من الدراسات المؤهلة من قبل باحث

undertaken.

Selection criteria

Studies were included if there was an attempt made using neural tension testing procedure and neural mobilization technique to improve the status of stroke patient.

Data collection and analysis

Data from eligible studies were extracted by a single reviewer. There were no specific outcome measures specified as inclusion criteria as there were only few studies that discussed our review content.

Main results

Studies which were a total number of 22 studies were screened, out of which 12 studies were selected for the review report. Out of the 12 studies 7 were RCTs, 3 Quasi experimental, 1 case report and 1 systematic analysis were identified to answer the review question.

Conclusions

This review concludes that there was no evidence documented in the past explaining the neural mechanics and periodic changes that take place following stroke. All the study except one concluded a positive therapeutic benefit of using neural mobilization. However, in consideration of their methodological quality, qualitative analysis of these studies exhibited that there is only limited evidence to support the use of neural mobilization techniques.

Key words: Stroke, Peripheral Neural Mechanics, Neural Mobilization, Neural tension.

واحد. ولم تكن هناك نتائج محددة تقيس تماماً المعايير الضمنية حيث لم تكن هناك سوي دراسات قليلة ناقشت محتوى بحثنا.

النتائج الرئيسية

لقد تم فحص الدراسات التي بلغ عددها الإجمالي ٢٢ دراسة، واختيرت منها ١٢ دراسة لكتابة البحث. ومن بين الدراسات الـ ١٢ التي أجريت، هناك ٧ منها غير مكتملة و٣ شبه تجريبية، و واحدة تقرير حالة. وتحليل منهجي واحد حول الإجابة عن سؤال البحث.

استنتاجات المؤلفين

يخلص هذا البحث إلى أنه لم تكن هناك أدلة موثقة في الماضي تشرح الميكانيكا العصبية والتغيرات الدورية التي تحدث بعد السكتة الدماغية. جميع الدراسات باستثناء واحدة توصلت إلى فائدة علاجية إيجابية من خلال استخدام الحركة العصبية. غير أن التحليل النوعي لهذه الدراسات، بالنظر إلى جودتها المنهجية، أظهر أنه لا توجد سوى أدلة محدودة لدعم استخدام تقنيات الحركة العصبية.

الكلمات الرئيسية: السكتة الدماغية، الميكانيكا العصبية الطرفية، الحركة العصبية، التوتر العصبي.

Introduction:

Neural tension is a procedure commonly used to describe dysfunction of the peripheral nerves. More recently, the word peripheral neural tension has given way to terminology of “Neurodynamics” which is a more accepted term referring to the symbiotic consideration of biomechanical, physiological, and morphological functions of the human nervous system (Butler DS, 2000; Shacklock MO, 2005). Researchers observed that nervous system is designed to adapt to mechanical loads, and undergo typical mechanical events like elongation, sliding, cross-sectional change, angulation, and compression. When these dynamic protective mechanisms fail, the nervous system is vulnerable to neural edema, ischemia, fibrosis, and hypoxia, which may cause altered neurodynamics. (Butler et al, 1994) neural mobilization as a technique is being employed in almost every neuro-musculo-skeletal condition. In these lines, this review tries to focus on neurodynamic changes after stroke and on neural mobilization techniques employed in the treatment of stroke subjects. Cerebrovascular disease (CVA) commonly called as stroke is the third leading cause of death and disability in developed countries (Hoyert 1999). Hemiplegia is the primary motor manifestation of CVA, which is weakness of one half of the body contralateral to the site of cerebral lesion. It is well established that the stroke subjects do not recover to co morbid status most often. There are various intervention like Bobath approach, Roods approach, Propriocep-

tive neuromuscular facilitation techniques, motor relearning programme, functional approaches, constrain induced movement therapy are all employed in the treatment of stroke subjects. Yet the neural tension testing procedures are not employed in assessment of hemiplegia and neural mobilization is not employed for management of Hemiplegia. Even after clear demonstration of the central nervous system involvement in peripheral nerve mobility there is no clear explanation of the neural mechanics following stroke. Butler, in 1995 stated that spasticity following stroke will result in nerve contractures. Thus, in this review a systematic analysis was done to find if there is any previous work done on altered neural mechanics following stroke and analysis was done to know whether the contribution of neural mobilization techniques as an intervention tool in stroke recovery.

Objectives:

Primary objectives

The primary aim of the review was to establish whether there is clear understanding about the status of peripheral neural mechanics following stroke

Secondary objectives

Secondary aim of the study was to analyze the contribution of neural mobilization techniques as an intervention tool in stroke recovery.

CRITERIA FOR CONSIDERING STUDIES FOR THIS REVIEW

Types of studies

As there was a very few literature available in answering the review questions all types of study which related neural mechanics with stroke were included in the review.

The reviewer also included the studies, which related neural mechanics with spasticity and tonal abnormalities.

Types of participants

Studies done with subjects with incidence of stroke both acute and chronic of both the genders were included in the review. The review also included subjects who had spasticity because of traumatic brain injury too.

Types of intervention

Studies included in this systematic review will have these characteristics:

- Neural mobilization techniques
- Peripheral nerve mobilization techniques
- Neuro dynamic testing and interventions.

Types of outcome measures

Outcome measures that relates to the prognosis of stroke patients like motor recovery, balance, gait, sensory recovery, functional recovery, coordination, quality of life and activities of daily living were selected.

SEARCH METHODS FOR IDENTIFICATION OF STUDIES

This review has drawn on the search strategy developed for the Stroke Group as a whole. Relevant trials were identified in the Stroke Group's specialized trials register. The last search for this review was carried out in June 2003. In addition the following electronic bibliographic databases were searched.

1. Cochrane Central Register of Controlled Trials (*The Cochrane Library*, Issue 4 2015)
2. MEDLINE 1995 to December 2015 (OVID)
3. EMBASE 1995 to December 2015 (OVID)
4. CINAHL 1995 to December 2015 (OVID)
5. Science Citation Index Expanded 1995 to December 2015
6. Web of Science Proceedings 1995 to December 2015
7. Physiotherapy Evidence Database (PEDro) 1995 to December 2015 (<http://www.pedro.fhs.usyd.edu.au/>)
8. REHABDATA 1995 to December 2015 (<http://www.naric.com/search/rhab/>)w

Table 1. Summary of all the studies included for the review

s. no	Author	Year	Title	Methods	Conclusion	Type	PS
1	Richard F. Ellis	2008	Neural Mobilization: A Systematic Review of Randomized Controlled Trials with an Analysis of Therapeutic Efficacy	Methodological assessment allowed an analysis of research investigating therapeutic efficacy of neural mobilization. Ten randomized clinical trials (discussed in 11 retrieved articles) were identified that discussed the therapeutic effect of neural mobilization	This review highlights the lack in quantity and quality of the available research. Qualitative analysis of these studies revealed that there is only limited evidence to support the use of neural mobilization	Systematic review	NA
2	To-masz-Wolny	2010	Butler's neuromobilizations combined with proprioceptive neuromuscular facilitation are effective in reducing of upper limb sensory in late-stage stroke subjects: a three-group randomized trial	A total of 96 late-stage stroke subjects were randomly assigned to three groups. Intervention: The therapeutic programme in the control group was based on traditional post-stroke methods. The second group (experimental 1) received in addition individual therapy based on the proprioceptive neuromuscular facilitation method. The third group (experimental 2) received a combination: traditional therapeutic programme plus individual proprioceptive neuromuscular facilitation exercises plus neuromobilization of the affected upper extremity. All groups received 18 training sessions lasting about 45 minutes each	Application of Butler's neuromobilizations combined with proprioceptive neuromuscular facilitation showed greater effectiveness in reducing sensory deficits than proprioceptive neuromuscular facilitation or traditional therapy alone.	RCT	5
3	Godoi J	2011	Electromyographic analysis of biceps brachii muscle following neural mobilization in patients with stroke.	A pre-experimental study was carried out with pretest and posttest repeated measurements on five stroke victims, with Grade 1 and + 1 spasticity, according to the modified Ashworth scale. Electromyographic analysis of the biceps brachii muscle was performed with the elbow flexed at 90 degrees, following by complete extension.	Neural mobilization was efficient in reducing myoelectric activity in the biceps brachii muscle in patients with stroke and may be used by physiotherapists as an efficient method for treating patients with this pathology.	Clinical trial	NA

4	Jessica Castilho	2011	Analysis of electromyographic activity in spastic biceps brachii muscle following neural mobilization	Repeated pre-test and post-test EMG measurements were performed on six stroke victims with grade 1 or 2 spasticity (Modified Ashworth Scale). The Upper Limb Neurodynamic Test (ULNT1) was the mobilization technique employed.	When performed using contralateral techniques, neural mobilization alters the electrical signal of spastic muscles	Clinical repeated measures trial	NA
5	Yong-Jeong Kim	2011	Comparison the Initial Effects of Nerve Mobilization Techniques(NM), Static Stretching(SS) and Contract-Relax(CR) on Hamstring Flexibility and Walking Ability in Post-Stroke Hemiplegia Patients,	Eleven patients with hemiplegia were included in this study. Passive knee extension (PKE) range of motion and the sit and reach (SR) test were used to measure hamstring flexibility, while timed up and go (TUG) and the 10m walking (10MW) test were used to measure the subject's gait. Measurements on each test were assessed prior to the experiment, immediately following the experiment, and 30 minutes after the experiment. Analysis of the results utilized a repeated measures analysis of variance to examine hamstring flexibility and the difference in walking ability	This study suggests NM, SS, and CR techniques immediately improve hamstring length and flexibility while improving gait function in patients with hemiplegia	Clinical trial	NA
6	Jakob-Lorentzen	2012	Neural tension technique(NTT) is no different from random passive movements in reducing spasticity in patients with traumatic brain injury	10 spastic patients with brain injury were included. An RCT study with crossover design evaluated muscle tone measured by: 1) hand-held dynamometer; 2) Modified Ashworth Scale (MAS); 3) and ROM by; 4) angles of resistance onset "catch" (R1) compensatory movement (R2); and 5) 'subjectively perceived reduction in muscle tone'. Outcome measures were recorded by three raters before and after a single treatment session	An objective evaluation of NTT demonstrates that it does not reduce spasticity. However, it does increase ROM with the same effect as RPM	RCT	6

7	Jorge H. Villafañe	2012	Botulinum toxin type A combined with neurodynamic mobilization for upper limb spasticity after stroke: a case report	<p>The patient underwent combined treatment with BoNT-A and NM of the upper limb in 6 monthly applications. Evaluation was performed pretreatment, 3 months after the first injection, 3 months after the second injection, and at a follow-up session 9 month after starting the treatment.</p> <p>The following outcomes were measured: pain by using a numeric rating scale, spasticity by the Modified Ashworth Scale for Grading Spasticity, acceptance and emotional reaction to the treatment by the Hospital Anxiety and Depression Scale, and functionality by ranges of motion. The patient improved in all outcomes after treatment, and results were maintained during the follow-up sessions</p>	The combined NM and BoNT-A treatment appeared to decrease pain and improve joint ranges of motion during treatment for this patient. The patient showed decreased anxiety and depression during and after the treatment.	A case report	NA
8	LIU Zhong-shu	2013	Effect of nerve mobilization plus rehabilitation therapy on function of lower extremity in patients with hemiplegia after stroke	<p>Forty-nine stroke patients were randomly divided into observation group (n=25) and control group (n=24). Both groups were given conventional rehabilitation training, and observation group received treatment of nerve mobilization additionally. Composite spasticity scale(CSS) was used for assessing the ankle planter flexor, Fugal-Meyer motor assessment(FMA) for the lower extremity, Erg balance scale(BBS) for stability and modified Barthel index(MBI) for activities daily living(ADL) before and after the treatment results</p>	Nerve mobilization combined with rehabilitation therapy in the treatment of stroke patients can decreaseanklespasticity and improve motor function of lower extremity, stability and activities of daily living	RCT	6
9	Hyun-Kyu Cha	2014	Effects of the Nerve Mobilization Technique on Lower Limb Function in Patients with Post stroke Hemiparesis	<p>20 stroke patients were randomly selected based on selection criteria and divided into two groups. In the subject group (n=10), sciatic nerve mobilization with conventional physical therapy was applied to</p>	study showed that sciatic nerve mobilization with conventional physical therapy was more effective for lower limb function than conventional	RCT	5

				patients. In the control group (n=10), only conventional physical therapy was applied to stroke patients	physical therapy alone in patient with post stroke hemiparesis		
10	SHI Jia-jia	2014	Effects of nerve mobilization techniques on lower limb movement function in patients with hemiplegia	Forty cases of patients with hemiplegia were randomly divided into two groups, 20 patients in each group. Both groups were treated with conventional drugs and rehabilitation training and observation group given peripheral nerve mobilization techniques of lower limb additionally. 10-m maximum walking speed, lower limb Fugle-Meyer assessment(FMA) on the hemiplegia side, the hamstrings and tibialis anterior muscle maximum isometric contraction EMG signal values(iEMG) were measured before and after treatment	Nerve mobilization techniques can obtain more satisfactory effects in restoring lower limb movement function of patients with hemiplegia	RCT	5
11	Yun-hyeok Shinu	2016	The Effects of Sciatic Nerve Mobilization on Hamstring Flexibility, Lower Limb Strength and Gait Performance in Patients With Chronic Stroke	Eleven patients with hemiplegia Sixteen subjects were recruited for this study. The subjects were randomly divided into two intervention groups and underwent either of the following two interventions: sciatic nerve mobilization or static stretching of the hamstring. We assessed hamstring flexibility, lower limb strength, and gait performance using a digital inclinometer, a hand-held dynamometer, and the 10-meter walk test, respectively. Subjects had a 24-hour rest period between each session in order to minimize carryover effects. Measurements for each test were assessed prior to and immediately after the intervention sessions.	Study indicated that the sciatic nerve mobilization technique may be more effective in muscle activation of the knee extensor muscle and knee flexor muscle than hamstring static stretching technique in patients with chronic stroke	RCT	6

12	Kelson-Carvelhedo,	2016	Effects of muscle strengthening, neural mobilization and vibration in patients with stroke	40 subjects were selected, of both genders divided randomly into four groups: muscle stretching group, neural mobilization group, vibratory stimulation group and control group. Before and after the intervention were assessed for balance and functional mobility through berg balance and time UP and GO test	It can be concluded that the three techniques applied brought immediate benefits to the public of the study participants with stroke squeal.	RCT	5
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Method of the review

Data Extraction:

A single reviewer independently selected the studies to be included in this systematic review and applied the selection criteria to the studies retrieved by the electronic search. The methodological quality of studies was assessed by the same reviewer. The reviewer contacted the authors of the selected studies when the article does not contain information on the methodological criteria by e-mail for additional information. Additional information was obtained including an indication as to whether different trialists were involved in intervention, outcome assessment, and reporting. Assessments were made of the validity and reliability of any outcome tool, scale or method employed by trialists of selected studies. Where missing information could not be retrieved the criteria were scored as 'unclear' or 'unknown'.

Data were extracted by reviewers which included the methods and methodological quality information, and the following;

Participants: Number recruited and

randomized, Average age; gender; stroke type, affected side; time from stroke to trial entry;

*Interventions:*Type of training - cardiovascular/strength/mixed;exercise mode; training *frequency*; training duration; training intensity; upper or lower limb training; affectedand/or unaffected side trained.

Setting: Inpatient or outpatient; supervised or self-lead; homebasedor hospital based.

Outcome measures: For continuous variables baseline values and measures of variability (mean and standard deviation (SD) or standard error (SE)) were recorded. If the SD of the mean difference was not specified it was calculated from the baseline data and follow-up data.

Quality Assessment

Assessments of quality were completed by the reviewer. Each study was evaluated using the previously validated Pedro score to assess the completeness and quality of reporting of RCTs as well as to assess for potential bias in the trial. The pedro score which was devel-

oped by central evidence based physiotherapy consists of 11 item scale which is valid, reliable and versatile tool in rating RCTs for the Pedro database. In many systematic reviews Pedro score has been used as a measure of methodological quality.

Results:

Selection of studies

The analysis of the review clearly indicated that the volume of research concerned with neuro mechanics following stroke was nil to the researchers knowledge. Further the amount of literature support and the quality of literature that supports neural mobilization technique as a tool in stroke rehabilitation is very limited. A total number of 22 studies were screened out of which 12 studies were selected for the review report. Out of the 12 studies 7 were RCTs, 3 Quasi experimental, 1 case report and 1 systematic analysis were identified to answer the review question. The summary of all the studies included for the study are illustrated in Table 1.

Methodological quality

Each paper was reviewed for methodological quality and represented by IVS as briefed in Table2. Out of 12 studies 7 of them were reviewed for IVS.

Study Characteristics

All studies used different methods of application of neural mobilization techniques like cervical lateral glides, slump sliders, pe-

ripheralnerve sliders and some studies chose to combinetechniques with other techniques like home-based neural mobilizationexercises, contract and relax techniques, vibration, strengthening techniques, static stretching. In one of the study in addition to neural mobilization techniques Botox was used. Therefore, all twelve studies were clinically and therapeuticallyheterogeneous, necessitating a qualitative analysis for summarizing the results. Table 4 contains details of study characteristics.

Therapeutic Efficacy

Out of the 7 RCTs only one (Jakob-Lorentzen) reported a negative result stating that the neural mobilization technique does not reduce spasticity. However, he concluded that it does increase Range of motion with the same effect as relaxed passive movements. One case study demonstrated that use of Botox and NM techniques were very effective in decreasing pain and improving joint range of motion during treatment for patients with stroke. The study also reported that the patient showed decreased anxiety and depression during and after the treatment which may be attributed to the drug effect and limbic system influence. One systematic review was included in the study which concluded that there was a lack in quantity and quality of the available research in neural mobilization. In the Qualitative analysis they revealed that there is only limited evidence to support the use of neural mobilization. There were three quasi experimental studies which are in the sup-

port of neural mobilization techniques. In the present review it's learnt that various terminologies were synonymously used for Neural Mobilization technique like Neural tension technique, neurodynamic mobilization, nerve mobilization technique.

Discussion:

Methodological Quality assessment was done for each paper and a quality score (QS) as a total of positive scores for 10 of the 11 items are given by the reviewer. Unlike the other items, Criterion One of the PEDro scale associates with the external validity and was not used in the final total PEDro score. QS for each paper is included in Table 2. The various items of the PEDro Score deal with different features of RCT study including internal validity, external validity, and statistics. To enable quantitative analysis of the methodological quality of a systematic review, van Tulder et al recommended the analysis of the internal validity criteria of any rating tool. For the PEDro Scale, seven items concern to internal validity were identified. These seven items include items 2, 3, and 5 through 9 (Table 2). An internal validity score (IVS) has also been used in other systematic reviews to allow calculation of the number of internal validity criteria met for that rating system and to thereby give an estimation of methodological quality. It was decided to evaluate an IVS for this review based on the relevant internal validity criteria of the PEDro Scale. The positive scores of each of these seven items were added simultaneously to calculate the IVS

(Table 3).

To stratify methodological quality, the summated score of the 7-item IVS, intended from the initial PEDro score (QS), was dispensed into three categories. A study of high methodological quality obtained IVS values of 6–7, a moderate quality obtained IVS values between 4–5, and a limited quality was attained between 0–3. This decision was made based on even cut-off points between 0 and 7. The analysis showed that there was no blinded studies. In all the studies groups were not similar at baseline which was a major bias. There were no enough long term follow up with only 45% of the studies had a reasonable follow up. There were 4 studies done from Korea and two from china. There were few more studies which were done in native language. The reviewer omitted studies which were not translated into English.

Stroke is an upper motor neuron lesion with very less manifestation on lower motor neurons. But secondary complication does take place in the neural mechanism due to spasticity and abnormal attitude of the extremities. Stroke rehabilitation is mainly concerned with motor rehabilitation. Motor rehabilitation comprises of voluntary control, balance and postural control training. It is evident from the study that neural tension testing has been proved to be effective in restoration of motor functions in stroke. This is achieved by its direct effect on the tone of the muscle which is evident from the review. Neural mobilization has improved the passive

range of motion much better than the active range of motion. Few studies have compared neural mobilization technique with conventional physiotherapy and few studies have used few more techniques along with neural mobilization technique like proprioceptive neuromuscular facilitation techniques and neurodevelopmental therapy. When discussing about the two components of neural mobilization namely diagnostic and therapeutic, there was no evidence found from the review for analyzing neural tension testing as a diagnostically significant tool in stroke subjects. It can be clearly seen that the area is still under

explored and needs more research. Whereas the therapeutic part of neural tension testing has been explored to a better extent than the Diagnostic part. The efficacy of neural tension testing as an intervention tool has been tested in both upper Limb as well as lower limb. The future study can concentrate on changes in the neural interfaces and the property of the nerve following the stroke. Neural tension testing has been proved to be effective in reducing the pain which is an important criterion in motor rehabilitation and about a significant improvement in the psychological quotient of the stroke subjects.

Table 2. PEDro Scores for RCTs

Author	1	2	3	4	5	6	7	8	9	10	11	QS	IVS	Methodological quality
Tomasz wolny	1	1	0	0	0	0	0	1	1	1	1	5	3	Limited
Jakob Lorentzen	1	1	1	0	1	1	0	1	0	1	1	6	5	Moderate
LIU Zhong-shu	1	1	1	0	0	0	0	1	1	1	1	6	4	Moderate
Hyun-Kyu Cha	1	1	1	0	0	0	0	0	1	1	1	5	3	Limited
SHI Jia-jia	1	1	1	0	0	0	0	0	1	1	1	5	3	Limited
Yun-hyeok Shin	1	1	1	0	0	0	0	1	1	1	1	6	4	Moderate
KelsonCarvelhedo	1	1	0	0	0	0	0	1	1	1	1	5	3	Limited

Table 3. Number and percentage of the studies meeting each PEDro criteria.

s.no	Criteria	Number Meeting criterion (N)	Percentage meeting PEDro Criteria criterion (%)
1	Eligibility criteria specified (yes/no)	7	63
2	Subjects randomly allocated to groups (yes/no)	7	63
3	Allocation was concealed (yes/no)	5	45
4	Groups similar at baseline (yes/no)	0	0
5	Subjects were blinded to group allocation	1	9
6	Therapists who administered therapy were blinded (yes/no)	1	9
7	Assessors were blinded (yes/no)	0	0
8	Minimum 85% follow-up (yes/no)	5	45
9	Intent to treat analysis for at least 1 key variable (yes/no)	6	54
10	Results of statistical analysis between groups reported (yes/no)	7	63
11	Point measurements and variability reported (yes/no)	7	63

Recommendation for future studies

Future studies can concentrate on doing an extensive analysis of the neural mechanical derangement prevailing in stroke subjects. This have to be done giving due consideration to the duration of stroke ailment, tone, musculoskeletal status, voluntary control and so on. The effectiveness of neural mobilization technique as an intervention tool in stroke rehabilitation has to be studied in elaboration with more number of subjects with a homogenous population.

Conclusion

This systematic review of the literature analyzed two important scenarios namely neural mechanics following stroke and neural mobilization as an intervention in stroke rehabilitation. This review concludes that there was no evidence documented in the past explaining the neural mechanics and periodic changes that take place following stroke. All the study except one concluded a positive therapeutic benefit from using neural mobilization. However, in review of their methodological quality, qualitative analysis of these studies exhibited that there is only limited evidence to support the use of neural mobilization techniques.

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References:

1. Butler DS, Shacklock MO, Slater H. Treatment of altered nervous system mechanics. In: Boyling J, Palastanga N, eds. Grieve's Modern Manual Therapy: The Vertebral Column. 2nd ed. Edinburgh, UK:Livingston Churchill, 1994:693–703.
2. Butler DS. The Sensitive Nervous System. Adelaide, Australia: NOI group Publications, 2000.
3. Castilho J, Ferreira LA, Pereira WM, Neto HP, da Silva Morelli JG, Brandalize D, Kerppers II, Oliveira CS. Analysis of electromyographic activity in spastic biceps brachii muscle following neural mobilization. *Journal of bodywork and movement therapies*. 2012 Jul 31;16(3):364-8.
4. Cha HK, Cho HS, Choi JD. Effects of the nerve mobilization technique on lower limb function in patients with post stroke hemiparesis. *Journal of physical therapy science*. 2014;26(7):981-3.
5. Ellis RF, Hing WA. Neural mobilization: a systematic review of randomized controlled trials with an analysis of therapeutic efficacy. *Journal of manual & manipulative therapy*. 2008 Jan 1;16(1):8-22.
6. Castilho J, Ferreira LA, Pereira WM, Neto HP, da Silva Morelli JG, Brandalize D,

- Kerppers II, Oliveira CS. Analysis of electromyographic activity in spastic biceps brachii muscle following neural mobilization. *Journal of bodywork and movement therapies*. 2012 Jul 31;16(3):364-8.
7. Godoi J, Kerppers II, Rossi LP, Corrêa FI, Costa RV, Corrêa JC, Oliveira CS. Electromyographic analysis of biceps brachii muscle following neural mobilization in patients with stroke. *Electromyography and clinical neurophysiology*. 2010;50(1):55-60.
 8. Hoyert DL, Kochanek KD, Murphy SL. Deaths: final data for 1997. *Natl Vital Stat Rep*. 1999 Jun 30;47(19):1-04.
 9. Villafane JH. Botulinum toxin type A combined with neurodynamic mobilization for lower limb spasticity: a case report. *Journal of chiropractic medicine*. 2013 Mar 31;12(1):39-44.
 10. LIU Zhong-shu, LIWei, ZHANG Rong, et al. Effect of nerve mobilization plus rehabilitation therapy on function of lower extremity in patients with hemiplegia after stroke. *Chinese J Rehabil*, 3, 2013.
 11. Lorentzen J, Nielsen D, Holm K, Baagøe S, Grey MJ, Nielsen JB. Neural tension technique is no different from random passive movements in reducing spasticity in patients with traumatic brain injury. *Disability and rehabilitation*. 2012 Nov 1;34(23):1978-85.
 12. Shacklock MO. Clinical applications of neurodynamics. In: Shacklock MO, ed. *Moving in on Pain*. Chatswood, UK: Butterworth-Heinemann, 1995:123–131.
 13. Shacklock MO. *Clinical Neurodynamics: A New System of Neuromusculoskeletal treatment*. Oxford, UK: Butterworth Heinemann, 2005.
 14. Tomasz Wolny, Edward SauliczRafał Gnat, MirosławButler's neuromobilizations combined with proprioceptive neuromuscular facilitation are effective in reducing of upper limb sensory in late-stage stroke subjects: a three-group randomized trial. *ClinRehabil* 2010 24: 810-821
 15. Kim YJ, Kim TY, Kim SY, Oh DW. Comparison the Initial Effects of Nerve Mobilization Techniques, Static Stretching and Contract-Relax on Hamstring Flexibility and Walking Ability in Post-Stroke Hemiplegia Patients. *Journal of the Korean Society of Physical Medicine*. 2011;6(4):369-79.
 16. Shin YH, Chon SC. The Effects of Sciatic Nerve Mobilization on Hamstring Flexibility, Lower Limb Strength and Gait Performance in PatientsWith Chronic Stroke. *Physical Therapy Korea*. 2015 Nov;22(4):8-16.

Review Article

The Privatization of Healthcare in selected First-world Countries and its Implications in the Kingdom of Saudi Arabia: A Descriptive-Comparative Study

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ABSTRACT

Background: A long-term debate persists in global health concerns about the proper balance in the delivery of health care services between the private and public sector to the people of the low and middle income countries. The private sector allies claim that private companies may be more efficient and receptive in fulfilling patient needs, while the public sector allies have stressed the incapacity of the poor people to pay that causes imbalances in access to health care.

Aim: This study aims to compare the healthcare privatization models of the United Kingdom, Germany, and Canada through health expenditure statistics. The findings will serve as a source of benefits from the privatization of health sectors in Kingdom of Saudi Arabia to strengthen its implementation.

Method: This is a descriptive-comparative research where the healthcare privatization model among the chosen first-world countries will be compared through the available health

hospital, private insurance, privatization

المخلص:

لا يزال هناك نقاش طويل الأمد حول المخاوف الصحية العالمية بشأن التوازن السليم بين القطاعين العام والخاص فيما يتعلق بتوفير خدمات الرعاية الصحية للمواطنين في الدول منخفضة ومتوسطة الدخل. في حين يزعم مناصرو القطاع الخاص أن الشركات الخاصة قد تكون الأكثر كفاءة وتلبية لاحتياجات المرضى، بينما يؤكد مناصرو القطاع العام على وجود حالات من عدم التوازن في الحصول على الرعاية الصحية بسبب عدم قدرة الفقراء على الدفع.

الهدف: تهدف هذه الدراسة إلى مقارنة نماذج خصخصة الرعاية الصحية في المملكة المتحدة، وألمانيا، وكندا من خلال إحصائيات الإنفاق الصحي. سوف تكون النتائج مصدرًا للاستفادة من خصخصة القطاعات الصحية في المملكة العربية السعودية لتعزيز تنفيذها.

النهج: يُعد هذا البحث بحثًا وصفيًا مقارنًا؛ إذ سيتم مقارنة نموذج خصخصة الرعاية الصحية بين دول العالم الأول المختارة من خلال إحصائيات الإنفاق الصحي المتاحة.

النتائج: حققت الولايات المتحدة الأمريكية أعلى نسبة إنفاق صحي إجمالي إذ ارتفعت النسبة المئوية من الناتج المحلي

expenditure statistics.

Results: The United States of America (USA) has the highest Total Health Expenditure as a percentage of the Gross Domestic Product with 15-17% since 2006, and lasted until 2014. Saudi Arabia has only 3-5% as compared to the selected first-world countries. The United Kingdom (UK), Germany, Canada, and Saudi Arabia have significantly higher General Government Health Expenditure as a percentage of Total Health Expenditure. On the contrary, the Private Health Expenditure (PvtHE) of USA is higher with 52-55% than the GGHE with only 45-48%. Also, the private insurance as a percentage of PvTHE of the USA is the highest with 63-65% as compared to UK, Germany, Canada, and Saudi Arabia.

Conclusion: The healthcare system of Saudi Arabia is a mainly public-funded and public-owned similar to the UK, Germany, and Canada. Despite of the effectiveness of the public-contract model, the private insurance or provider model and the privatization of hospitals could notably change the healthcare system in Saudi Arabia. Thus, the resources and the quality of health care services in Saudi Arabia must be enhanced through these mechanisms.

Keywords: health care, healthcare services,

الإجمالي من 15 – إلى 17 % من عام 2006 حتى عام 2014، في حين كانت النسبة في المملكة العربية السعودية من 3 إلى 5 % مقارنةً ببلدان العالم الأول المختارة في الدراسة.

تمتلك كل من المملكة المتحدة، وألمانيا، وكندا، والمملكة العربية السعودية نسبة أعلى بكثير من الإنفاق الحكومي العام على الصحة كنسبة مئوية من إجمالي النفقات الصحية. وعلى النقيض من ذلك نرى أن الإنفاق الخاص بالقطاع الصحي الخاص للولايات المتحدة الأمريكية أعلى بنسبة تتراوح ما بين 52 و53 % من إجمالي الإنفاق الحكومي العام على الصحة الذي يأتي بنسبة 45 – 48 % فقط. وكذلك نجد أن نسبة التأمين الصحي للقطاع الخاص في الولايات المتحدة الأمريكية هي الأعلى إذ تبلغ نسبته 63 – 65 % مقارنةً بالمملكة المتحدة، وألمانيا، وكندا، والمملكة العربية السعودية.

خاتمة: إن نظام الرعاية الصحية في المملكة العربية السعودية ممول ومملوك بشكل أساسي للقطاع العام على غرار المملكة المتحدة، وألمانيا، وكندا. وعلى الرغم من فعالية نموذج التعاقد العام فإن نظام التأمين الخاص أو نموذج تقديم الخدمات وخصخصة المستشفيات يمكنه أن يغير نظام الرعاية الصحية بالمملكة العربية السعودية بشكل ملحوظ، وبالتالي يجب تعزيز موارد خدمات الرعاية الصحية في المملكة العربية السعودية ونوعيتها من خلال هذه الآليات.

INTRODUCTION

The enduring and diverged debate that concerns the global health is the proper balance in the delivery of health care services between the private and public sector to the people of the low and middle income countries [1]. Up to present, the heat is becoming more intense regarding the disputes among the advocates of public and private systems. In 2007, the economic recession worldwide began that triggered major constrictions on government funds which significantly affected the health care expenditures in most countries [2]. The World Bank suggest to adhere to more realistic methods that is built on what is existing, thus, in countries where public sector services execute inadequately, the government must establish partnership with the private sector [3].

On one hand, the public hospitals have been developed and financed by governments to deliver all types of treatment either free or at subsidized rates to everyone regardless of their class or status [4]. On the other hand, the World Health Organization (WHO) differentiate the incremental or passive privatization with the programmatic or active privatization [5]. The first is perceived as the product of the public health care failure to meet the demands, while the second is associated with a purposeful and ideologically driven scheme. However, in practice, both types may oc-

cur [6]. Also, the European Observatory on Health Systems and Policies [7] described the health care services and hospitals privatization as the transfer of proprietorship of what was a part of the public into the hands of either private for-profit or private non-profit groups.

There is an enduring debate among the supporters that initiated their division. One group demands to pursue universal state-based health care accessibility, and the another calls for the private sector to deliver care in various areas where the public sector is unsuccessful. The supporters of the private sector have pointed to substantiation that the private sector is considered as the chief provider, because there are many underprivileged patients who choose to obtain care at private clinics [1]. Also, they have insinuated that because of market rivalry, the private sector may be more efficient and receptive to patient needs that possibly overcomes the ineffectiveness and corruption of the government [8]. In contrast, it is emphasized by the public sector supporters that there are inequalities in access to healthcare subsequent to the incapability of the poor to pay for availing private services. [8].

Certainly, the peak shares of private healthcare expenditure in the whole healthcare expenditure in 2006 were recorded by developing countries which include the Kingdom of Saudi Arabia. The total cost of health in Saudi Arabia is 3.8% of Gross Domestic

Product (GDP) with 77.1% from the government and the remaining 22.9% from the private sectors [9]. Both the government and private groups operate the hospitals and primary health centers in Saudi Arabia. In particular, the Ministry of Health assumes the primary obligation to deliver preventive, curative and rehabilitative services in the Kingdom's health care [10]. It is noteworthy that there was a notable increase in the involvement of private sector in health care in the Kingdom [11]. The Ministry of Health delivers the majority (60%) of the healthcare services, while the remaining 40% is jointly delivered by other government offices and the private sector [10]. However, the part of the private sector in delivering healthcare services is insignificant compared to the public sector. The private sector only accounts for the 21.1% of the 53,888 hospital beds in Saudi Arabia [12]. The population projection in 2020 is about 36 million [13]. Thus, it is essential that the involvement of the private sector needs to rise [14]. This study aims to compare the healthcare privatization models from select first-world countries through health expenditure statistics. The results of this research will serve as a basis of the possible benefits from the privatization of health sectors to the Kingdom of Saudi Arabia to reinforce its implementation.

REVIEW OF LITERATURE

The health care system and its privatiza-

tion among selected first-world countries

United Kingdom

The four publicly financed healthcare systems in the countries of the UK are jointly the UK NHS which was founded in 1948, and is mainly funded through central taxation and remains free at point-of-care for the UK population, apart from charges on adults (>18 years old) for prescriptions, and optical and dental services. The health systems in the four UK nations have operated independently since 1999. Each nation has its government department to develop health policy. The UK Parliament sets the total budget obtainable to the NHS in England and assigns a block funding to each devolved national government to meet local needs. Each state is free to select how much of its block funding to devote to health care [15].

Approximately 13% of the population chooses to pay for additional private sector insurance and then use independent healthcare providers. Private health insurance is often funded by employers as part of an employee benefits program, and sometimes they provide coverage for the entire family [15].

Around 12 million people were covered for medical expenditures in 1997 by health insurance, friendly societies, and cash plan firms. An estimate of 7 million people (12%) were covered by private health insurance. This population is consisted of older

people and citizens who belong to social classes I-III, with a noted coverage varying from 2% and 22% for social class IV and social class I, respectively [16].

In 1996, the private sector delivered a remarkable 13.4 billion cumulative worth of services. The highest percentage of money (46%) is consumed for the benefits of elderly and physically incapacitated people, followed by pharmaceutical products and devices (22%), and last by acute hospitals (17%). However, it is noteworthy that the significant supplier of private beds is the National Health Service (NHS). Specifically, in 1997, there were an estimate of 1,400 allotted pay beds in NHS private units, and 39% were prominent in London. The Health and Medicines Act in 1989 did not restrict the NHS authorities from charging market costs for their provided services [16].

Germany

The Statutory Health Insurances (SHI) cover majority of the population (90%) in Germany that is known for a worldwide multi-payer healthcare system. The income-based contribution is the common means of SHI to raise their budget [17]. The self-employed and higher income earners have the option to opt out of SHI, which in turn they could be insured by Private Health Insurance (PHI) [18].

The government provided the 77% of healthcare funding, while the remaining

23% came from the private sources which include the insurance and direct payments in 2009. These percentages are almost the same in Canada with 71% and 29% respectively in the same year, according to Organization of Economic Co-operation and Development (OECD) data, even though the former has a higher percentage of its people who is more than 65 years of age [19].

In 2010, the German hospital sector is consisted of an estimated 2,064 acute care hospitals from three different sectors. These categories include the private for-profit that is owned by municipalities, the private not-for-profit that is frequently owned by religious organizations, and the public ownership [20]. The patients are free to choose where they will be treated in any public sector which led to the competition of hospitals. This practice had transformed the system into a patient-oriented health care that prevented the customs of rationing, prioritization of treatments, and waiting list. Thus, it resulted to a much lower waiting time for the medical procedures [21].

There is an ongoing transformation regarding the structure of ownership of hospitals in Germany. It is noteworthy that there was a continuous rise in the market share of private for-profit hospital in the past 20 years [22]. Many municipalities had decided to privatize their hospitals mainly because of the deleterious growth in their public finances [23]. Between 1991 and 2010, the number of

private for-profit hospitals had significantly grown around 90%, while the public hospitals had notably decreased by 43% [24].

United States of America

Most of the Americans below the age of 65 years obtain tax-exempt from their employers regarding health assistances. The employers choose the insurance companies and the plans for their employees, and they pay a portion of the premiums [25]. But the offer of this benefit is only voluntary, and not each employer prefers to do it. If this is offered to the employees, the assistances are not all-inclusive. Progressively, companies limit their contributions which increases the burden of rising costs on the employees [26]. As a result, the employees frequently turn down this benefit because of the additional cost to pay their rising part of the premiums.

It is noteworthy that most of the private insurers are typically owned by the investors of the for-profit companies. They attempt to retain the premiums low and the incomes up by stinting on medical services. Specifically, the best means for the private insurers to compete is by excluding high-risk patients in the coverage, diminishing the coverage of those they already insured, and giving back the costs to patients as deductibles, co-payments and claim rejections [25].

The Medicare, a single-payer program that is fixed within the private system, is the major part of the US health care system that is

administered by the government. This system is considered to be the most efficient portion of the US system with above costs to government around 2% [27]. It is notable that it covers almost everyone above 65 years old for the full package of benefits including those that are high-risk or chronically ill patients. However, the US Medicare is not perfect, and it has been deteriorated by the past administration of Bush. There has been a significant rise in the out-of-pocket costs for Medicare recipients. Furthermore, many of similar inflationary forces affect the private insurance since the Medicare pays in a private, market-based system. One of these is the arrangement of the fee of the doctors to compensate specialists who are highly paid for doing many expensive procedures. As a consequence, the rise in the Medicare system is almost as high as the surge in the private sector [28].

Canada

In 1972, the Medical Care Act was commissioned by the Yukon Territory that resulted to the insurance coverage of all Canadians excluding home care and prescription drugs [25]. The other health care assistances were left to specific provinces if they were covered at all. Also, many hospitals and doctors added extra charges and costs to patients. However, the said practices were over in the Canada Health Act of 1984. This act necessitates federal assistances to the provincial expenses so that the health care services are

available to everybody, and it broadly eradicated the additional fees and charges [29].

During the 1990s, the Medicare in Canada became underfunded as a result of its economic recession. The waiting lists transpired into a political issue, and the public contentment dropped slightly. The economic situations became better in the near end of the 1990s as reflected by the rise in the publicity of the waiting lists and the start of the provinces to set more money into their health care system [29].

The supreme court of Canada specified its resolution in 2005 involving the *Chaoulli v. Quebec* [30]. It believed that there was a violation in the human rights by the province of Quebec with the 1-year delay for a hip replacement. Quebec would have to cut the waiting times or to authorize the procedure to be performed in a private system. The decision has been somewhat biased, but it added strength to a tough move throughout Canada most especially in Alberta and British Columbia. It caused to authorize the promotion of the coverage for private insurance, and the distribution of the delivery of care by doctors who are employed in the public and private systems in for-profit facilities. The doctors and the services would be capable of billing Medicare and increase extra charges [31].

METHOD

This is a descriptive-comparative study where the health care privatization

model among the selected first-world countries was compared through the use of health expenditure statistics from World Health Organization, World Bank, and Saudi Arabia Ministry of Health [32-34]. Then, these countries will also be compared to Saudi Arabia to determine its practical implications for its future implementation.

RESULTS

The comparison of the health expenditure among selected first-world countries and Saudi Arabia

Table 1 provides more details on health care financing and expenditure among select first-world countries and Saudi Arabia. The United States of America (USA) has the highest Total Health Expenditure (THE) in proportion with the Gross Domestic Product (GDP) with 15-17% from 2006 until 2014 among the select first-world countries, then the rest have nearly the same proportion. However, Saudi Arabia has only 3-5% of THE as a percentage of the GDP as compared to the first-world countries which is two to four times higher.

The United Kingdom (UK), Germany, and Canada have significantly higher General Government Health Expenditure (GGHE) in proportion with THE that ranges from 70-84%, with the UK as leading with as high as 84% in 2010. Further, these countries have lower Private Health Expenditure (PvtHE) as a percentage of THE that ranges from 16-30% only. On the contrary, it is noteworthy that the

Table 1. Health expenditure data among select first-world countries and Saudi Arabia.

	United Kingdom			Germany			Canada			United States of America			Saudi Arabia		
	2006	2010	2014	2006	2010	2014	2006	2010	2014	2006	2010	2014	2006	2010	2014
Indicators															
Total Health Expenditure (THE) % Gross Domestic Product (GDP)	8	10	9	10	11	11	10	11	10	15	17	17	4	3	5
General Government Health Expenditure (GGHE) as % of Total Health Expenditure	82	84	83	76	76	77	70	70	71	45	47	48	74	65	75
Private Health Expenditure (PvtHE) as % of Total Health Expenditure (THE)	18	16	17	24	24	23	30	30	29	55	53	52	26	35	25
Out of Pocket Expenditure (OOPS) as % of Total Health Expenditure (THE)	10	10	10	14	14	13	15	15	14	13	12	11	16	20	14
Out of Pocket Expenditure (OOPS) as % of Private Health Expenditure (PvtHE)	54	58	58	59	58	57	49	49	47	24	22	21	61	56	56
Private Insurance as % of Private Health Expenditure (PvtHE)	15	19	20	38	39	39	41	41	43	63	65	64	10	22	22

PvtHE of USA is higher with 52-55% than the GGHE with only 45-48%. On the other hand, Saudi Arabia is similar to the UK, Germany, and Canada, where the GGHE is greater with 65-75% than the PvtHE which is 25-35% only.

It is remarkable that the USA has the

lowest Out-of-Pocket (OOPS) as a percentage of PvtHE with 21-24% compared to the UK, Germany, and Canada with as high as 47-59%. However, the private insurance as a percentage of PvtHE of the USA is the highest with 63-65% when matched to UK, Germany, and Canada with 15-43% only. On

the other hand, Saudi Arabia is also similar to the OOPS of UK, Germany, and Canada as a percentage of PvTHE with 56-61%, and it is significantly higher than the private insurance with 10-22% only. Further, it is also important to note that Saudi Arabia has the most top OOPS as a percentage of THE with 14-20% when compared to the first-world countries with only 10-15% only.

The comparison of health care among selected first-world countries and Saudi Arabia

The comparison of health care among the selected first-world countries and Saudi Arabia is depicted in table 2. It is notable that Saudi Arabia has the lowest life expectancy with 74.3 when compared to the first-world countries with 78.9-81.9. Further, Saudi Arabia has the highest infant mortality with 12.50 which is two to four times higher when compared to 3.2-5.8 only in the select first-world

countries. On the other hand, Germany stands out regarding the number of physicians, nurses, and hospital beds which are two to three times greater than the rest of the select countries including Saudi Arabia. Further, Saudi Arabia has a similar number of physicians and hospital beds to the UK, Canada, and the USA, however, the number of nurses is two times lower than the rest.

DISCUSSION

This study reviews the privatization of the health care among selected first-world countries and Saudi Arabia. The health care models of each country was also compared through health expenditure statistics. It was found that the USA has the highest Total Health Expenditure (THE) with proportion to GDP compared to other select countries in this study. The top health expenditure noted in the USA is neither the result of its supe-

Table 2. The differences in health care among select first-world countries and Saudi Arabia (2014).

Measure	United Kingdom	Germany	Canada	United States of America	Saudi Arabia
Life expectancy	81.4	81.2	81.9	78.9	74.3
Infant mortality per 1000 live births	3.9	3.2	4.3	5.8	12.50
Physicians per 1000 population	2.79	4.11	2.50	2.57	2.33
Nurses per 1000 population	8.19	13.24	9.78	8.99	3.72
Hospital beds per 1000 population	2.73	8.23	2.67	2.83	2.14

rior wealth nor the age of its people [35]. The Organization of Economic Co-operation and Development (OECD) works on relative price levels in health. It specifies that the prices and not the volumes of health services provide the most to explicating the greater spending of USA in health care [36]. Some of the possible reasons for the rise of the health price levels topping the general price levels includes: an extreme intense use of health-related technologies [37]; division in the insurance systems [38]; and an excessive level of provider concentration [39].

It is remarkable that although the trend of the Total Health Expenditure (THE) of Saudi Arabia is increasing, it has a much lower THE as compared to selected first-world countries. The rapidly rising population which grows annually at the rate of 3.6% has been a vital factor in the rise of health costs. Also, the free services for all Saudis significantly contributes to its rising costs. The free services exclusive of a co-insurance payment combined with practically no economic constrictions on the provider significantly raise the quantity and amount of used services [40]. A notable consequence of long waiting times for many services are brought about by the increased demand in addition to the slow construction for more capacity. Specifically, the typical waits for non-emergent care lasted for certain months or years. The projections indicated that Saudi Arabia necessitates nearly

25,000 new hospital beds before 2010 so as to meet the current and growing demands [41].

The UK, Germany, and Canada have a notably higher General Government Health Expenditure (GGHE) in proportion with THE compared to USA which has the highest Private Health Expenditure (PvtHE) as a percentage of THE among the rest of the countries in this study. The private insurance model that is evident in the USA has a voluntary insurance coverage wherein the excessive quantity of choice is joint with the weaker price control. Specifically, the USA except the Medicare does not possess a centralized authority to establish the health care budgets or to negotiate with providers [39]. In contrast, Canada, France, and Germany have a public-contract model that provides a centralized authority to the national government or social insurance administration. This model provides more control above all the health care institutions that results to a lower administrative expenditures compared to the multi-payer systems [42].

Saudi Arabia is similar to the public-contract model of Canada, France, and Germany, where the GGHE is greater than the PvtHE. Majority of the finances in health care are provided by the government (75%), and the rest are coming from the out-of-pocket expenditures (25%). It is noteworthy that there has been a low level of private insurance used in the delivery of health care, and almost all of

the expenses in availing private services in the hospitals and clinics have been out-of-pocket payments (OOPS) [40], which is reflected in the result of this study. Moreover, Saudi Arabia has the highest OOPS when compared to the rest of the first-world countries in this study despite having a significantly lower PvtHE. On a yearly basis, the government is distributing funds to specific ministries and programs. If additional funding is necessary to support particular health programs and projects, the royal decree may be published in public [40].

It is vital to note that although Saudi Arabia has the same public-contract model with Canada, France, and Germany, the life expectancy is lower and the infant mortality is two to four times higher than the rest of the first-world countries in this study. This implies that there will be a loss in the productive workforce, high dependency ratio, and the government spending will be higher in the health care. On the other hand, Germany is found to have the largest number of physicians, nurses, and hospital beds which is two to three times greater than the rest of the selected countries including Saudi Arabia. It is essential to note that in Germany, the private for-profit hospitals quality of care is superior when matched to both the public and private not-for-profit hospitals [43]. Particularly, the private for-profit hospitals in Germany have the most few waiting times in receiving care

when there is a scheduled appointment with a specialist. They admit patients quicker than private not-for profit hospitals (16.4%), and public hospitals (3.1%) [44]. Moreover, previous studies have revealed that after privatization, the quality of previous public hospitals has notably improved, and there has been a rise in the number of physicians per hospital bed [45].

Moreover, Saudi Arabia has a comparable number of physicians and hospital beds to the UK, Canada, and the USA, however, the number of nurses is two times lesser than the rest. There has been a significant increase in the educational capability among Saudis, and yet, the enormous majority of health care providers in Saudi Arabia remains to be non-Saudis. It is notable that only about 17% represents the entire number of Saudi physicians and nurses despite of the rigorous efforts that have been created by the government [46]. As a consequence, a major drawback is continuity because expatriates tend to stay in Saudi for only a little time with an estimate of 2.3 years [47]. Likewise, the continuous turnovers led to the increase in the outdated and unused costly equipment left by expatriates because oftentimes the new physicians will require specific equipment as terms in their contract that later on will be underused and idle after exit [40].

CONCLUSIONS AND POLICY IMPLICATIONS

In the light of the evidence presented in this study, it is important that the resources and the quality of service provided by both public and private health care institutions in Saudi Arabia must be improved. The health care system in Saudi Arabia is a predominantly public-funded and public-owned similar to the UK, Germany, and Canada. Even though the public-contract model is effective based on the statistics mentioned in this study, the private insurance or provider model and the privatization of hospitals could significantly change the healthcare system in Saudi Arabia. In particular, the motivation of the health care providers will be noticeably changed. Some of the positive outcomes would comprise additional national government incomes from the sale of hospitals, the growth in the drive to deliver more efficient health care, and the transfer of the accountability from the government to private companies. Also, privatization could decrease the waiting times in the hospitals which leads to faster admission and better quality care in general. Privatization could generate a more efficient system, hiring lesser employees, and significant decrease in the disbursement for health care from the national budget of the government. However, a careful note is that the private hospital may increase the charges if the government has no sufficient control. In turn, the health care ex-

penses of the government may stay the same or worse it could essentially upsurge, as the consequence of greater costs for incomes and marketing.

Careful attention should be taken as the Saudi Arabia shifts to a more private health care system, to preserve the strong stewardship of the national government to the market conditions, and the tough framework in monitoring. It is frightening to profoundly shift the direction of a health care system. However, it seems that the political drive and the necessity exist in Saudi Arabia to initiate this process. It is vital that there will be an established continuous monitoring and adjustments as this complex process goes forward, since the health and the welfare of its people will be directly affected by these significant changes.

REFERENCES

1. Berendes S, Heywood P, Oliver S, Garner P (2011) Quality of private and public ambulatory health care in low and middle income countries: systematic review of comparative studies. *PLoS Med* 8: e1000433. doi:10.1371/journal.pmed.1000433.
2. Stuckler D, Basu S, Wang SW, McKee M (2011) Does recession reduce global health aid? evidence from 15 high-income countries, 1975–2007. *Bull World Health Organ* 89: 252–257.
3. World Bank (2009) World Bank responds to new Oxfam health report. Washington

- (District of Columbia): World Bank.
4. Rachlis, M. (2007) "Privatized Healthcare Won't Deliver", *Commissioned Policy Research*, Toronto: Wellesley Institute.
 5. Øvretveit J. 1996. Beyond the public-private debate: the mixed economy of health. *Health Policy* 35: 75–93.
 6. Øvretveit, John. "Nordic privatization and private healthcare." *The International journal of health planning and management* 18.3 (2003): 233-246.
 7. European Observatory on Health Systems and Policies. (2008). Glossary. Geneva: WHO European Centre for Health Policy.
 8. Rosenthal G, Newbrander W (1996) Public policy and private sector provision of health services. *Int J Health Plann Manage* 11: 203–216.
 9. World Health Organization (2005) Saudi Arabia: national expenditure on health. Available at: <http://www.emro.who.int/emrinfo> (accessed 09 September 2017).
 10. Aldossary A, While A, Barriball L. Health care and nursing in Saudi Arabia. *International nursing review*. 2008 Mar 1;55(1):125-8.
 11. Al-Yousuf, M., Akerele, T.M. & Al-Mazrou, Y.Y. (2002) Organization of the Saudi health system. *Eastern Mediterranean Health Journal*, 8, 4–5.
 12. Ministry of Health, (2008). *Health Statistical Year Book*. Riyadh: Ministry of Health Press.
 13. Schieber, G., (2001). "Vision 2020 Health Sector Report", in *Ministry of Economy and Planning's Future Vision for the Saudi Economy*. Riyadh: Ministry of Economy and Planning Press.
 14. Albejaidi FM. Healthcare system in Saudi Arabia: An analysis of structure, total quality management and future challenges. *Journal of Alternative Perspectives in the Social Sciences*. 2010;2(2):794-818.
 15. Wolfe I, Sigfrid L, Chanchlani N, Lenton S. Child Health Systems in the United Kingdom (England). *The Journal of pediatrics*. 2016 Oct 31;177:S217-42.
 16. Doyle Y, Bull A. Role of private sector in United Kingdom healthcare system. *BMJ: British Medical Journal*. 2000 Sep 2;321(7260):563.
 17. GKV Spitzenverband, *Statutory health insurance*, http://www.gkv-spitzenverband.de/Statutory_health_insurance.gkvnet.
 18. PKV Verband, *Zahlenbericht der Privaten Krankenversicherung 2010/2011*, 2011, http://pkv.de/w/les/shop_zahlenberichte/zahlenbericht20102011.pdf.
 19. OECD, *Health at a Glance 2011*, 2011, p. 151.
 20. Economist Intelligence Unit, *Germany: Healthcare and Pharmaceuticals Report*, December 2011.
 21. Cathy Schoen, Robin Osborn, David Squires, Michelle M. Doty, Roz Pierson, and

- Sandra Applebaum, "How Health Insurance Design Affects Access To Care And Costs, By Income, In Eleven Countries," *Health Affairs*, Vol. 29 (2010), No. 12, pp. 2323-2334; Karen Davis, Cathy Schoen, and Kristof Stremikis, *Mirror, Mirror on the Wall: How the Performance of the U.S. Health Care System Compares Internationally*, Commonwealth Fund, June 2010, p. v.
22. Oliver Tiemann and Jonas Schreyögg, *Changes in Hospital Efficiency after Privatization*, Hamburg Center for Health Economics, 2011, p. 2.
 23. "Germany's local nances: Hundreds of mini-Greeces," *The Economist*, April 20, 2011.
 24. Statistisches Bundesamt, *Grunddaten der Krankenhäuser*, Fachserie 12 Reihe 6.1.1, 2011, p. 13.
 25. Angell M. Privatizing health care is not the answer: lessons from the United States. *Canadian Medical Association Journal*. 2008 Oct 21;179(9):916-9.
 26. Geyman J. *Do not resuscitate: Why the health insurance industry is dying and how we must replace it*. Monroe (ME): Common Courage Press; 2008.
 27. Potetz L. *Financing Medicare: an issue brief*. Washington (DC): Kaiser Family Foundation; 2008. Available: www.medicareadvocacy.org/Reform_08_01.KaiserBriefReMAFinancing.pdf (accessed 2008 Aug 27).
 28. Relman AS. *A second opinion: rescuing America's health care*. New York (NY): Public Affairs; 2007.
 29. Marchildon GP. *Health systems in transition: Canada*. Toronto (ON): University of Toronto Press; 2005.
 30. *Chaoulli v. Quebec* (Attorney General), no 29272, Sup Ct of Canada 130 CRR (2d) 99; 2005 CRR LEXIS 76.
 31. Steinbrook R. Private health care in Canada. *N Engl J Med* 2006;354:1661-4.
 32. World Health Organization (WHO). Health expenditure database 2004-2016. Available: <http://apps.who.int/nha/database> (accessed September 11, 2017)
 33. World Bank (WB). World bank data. Available: <https://data.worldbank.org> (accessed September 11, 2017)
 34. Ministry of Health, (2014). *Health Statistical Year Book*. Riyadh: Ministry of Health Press.
 35. Lorenzoni L, Belloni A, Sassi F. Health-care expenditure and health policy in the USA versus other high-spending OECD countries. *The Lancet*. 2014 Jul 11;384(9937):83-92.
 36. Squires DA. Explaining high health care spending in the United States: an international comparison of supply, utilisation, prices, and quality. New York, NY: Commonwealth Fund, 2012.

37. Chandra A, Skinner J. Technology growth and expenditure growth in health care. Cambridge: National Bureau of Economic Research, 2011.
38. Moriya AS, Vogt WB, Gaynor M. Hospital prices and market structure in the hospital and insurance industries. *Health Econ Policy Law* 2010; **5**: 459–79.
39. White C. Health care spending growth: how different is the United States from the rest of the OECD? *Health Aff (Millwood)* 2007; **26**: 154–61.
40. Walston S, Al-Harbi Y, Al-Omar B. The changing face of healthcare in Saudi Arabia. *Annals of Saudi medicine*. 2008 Jul 1;28(4):243.
41. Al-Shaikh, S. August 7, 2006, “Saudi health care Sector: need for More investment” Arab news.
42. Docteur E, Oxley H. Health-system reform: lessons from experience. In: Organization for Economic Co-operation and Development. The OECD health project: towards high-performing health systems. Paris: OECD Publishing, 2004.
43. Oliver Tiemann and Jonas Schreyögg, “Effects of Ownership on Hospital Efficiency in Germany,” *Business Research*, Vol. 2 (2009), No. 2, pp. 115-145.
44. Björn A. Kuchinke, Dirk Sauerland, and Ansgar Wübker, *Determinanten der Wartezeit auf einen Behandlungstermin in deutschen Krankenhäusern: Ergebnisse einer Auswertung neuer Daten*, Technische Universität Ilmenau, 2008.
45. Roeder FC, Labrie Y. The private sector within a public health care system: The German example. *Health Care*. 2012 Feb.
46. Saudi Arabian Ministry of health. 2005, health statistic book for the year of 2005. retrieved January 2007 from <http://www.moh.gov.sa/statistics/1425/index.html>
47. Mufti, M. 2004, healthcare development Strategies in the Kingdom of Saudi Arabia. Springer.

GUIDELINES FOR MANUSCRIPT PREPARATION

A. TYPES OF MANUSCRIPTS

I. ORIGINAL MANUSCRIPTS

Manuscripts submitted in this category are expected to be concise, well organized, and clearly written. The maximum length is 5000 words, including the abstract, references, tables, and figure legends. The maximum length is 5000 words, including the abstract, references, tables, and figure legends.

- The structured abstract must not exceed 250 words.
- The title must not exceed 130 characters.
- A maximum of 4 tables and 4 figures is allowed.
- References should not exceed a maximum of 100.
- The abstract must be organized as follows:
 - Background & Aims
 - Methods
 - Results
 - Conclusions
- Do not use abbreviations, footnotes or references in the abstract.
- An electronic word count of the abstract must be included.
- Three to ten key words at the end of the abstract must be provided.

The manuscript must be arranged as follows:

- Title page
- Abstract
- Introduction
- Materials and methods (or Patients and methods)
- Results
- Discussion
- Acknowledgements
- References
- Tables
- Figure legends
- Figures

Acceptance of original manuscripts will be based upon originality and importance of the investigation. These manuscripts are reviewed by the Editors and, in the majority of cases, by two experts in the field. Manuscripts requiring extensive revision will be at a disadvantage for publication and will be rejected. Authors shall be responsible for the quality of language and style and are strongly advised against submitting a manuscript which is not written in grammatically correct English. The Editors reserve the right to reject poorly written manuscripts even if their scientific content is qualitatively suitable for publication. Manuscripts are submitted with the understanding that they are original contributions and do not contain data that have been published elsewhere or are under consideration by another journal.

II. REVIEW ARTICLES

Review articles on selected clinical and basic topics of interest for the readers of the Majmaah Journal of Health Science will be solicited by the Editors. Review articles are expected to be clear, concise and updated.

- The maximum length is 5000 words, excluding the summary, references, tables, and figures.
- References should not exceed a maximum of 150.
- The inclusion of a maximum of 4 high-quality tables and 4 colored figures to summarize critical points is highly desirable.
- Review articles must be accompanied by a title page and a summary.

- Reviews should include at least one Key Point Box, with a maximum of 5 bullet points, that briefly summarizes the content of the review.

Review articles are reviewed by the Editors and may be sent to outside expert reviewers before a final decision for publication is made. Revisions may be required.

III. EDITORIALS

This section consists of invited brief editorial comments on articles published in the Majmaah Journal of Health Science

The length of an editorial should not exceed 1500 words, excluding references.

- A maximum of 1 table or 1 figure is allowed.
- References should not exceed a maximum of 20.
- A title page must be provided.

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Case reports would be only accepted if they represent an outstanding contribution to the Etiology, pathogenesis or treatment of a specific condition.

- The maximum length is 3000 words, including the summary and references.
- A maximum of 2 tables and 2 figures is allowed.
- References should not exceed a maximum of 15.
- A title page must be provided.

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Letters to the Editor will be considered for publication if they are related to articles published in recent issues of Majmaah Journal of Health Science. Occasionally, Letters to the Editor that refer to articles not published in Majmaah Journal of Health Science will be considered.

The length of a Letter to the Editor should not exceed 800 words.

- A maximum of 1 table or 1 figure is allowed.
- References should not exceed a maximum of 10.
- No more than 4 Authors may appear in the author list.

VI. COMMENTARIES

International commentaries will be solicited by the Editors only.

- Commentary articles should not exceed a maximum of 800 words, excluding tables or figures.
- A maximum of 1 table or 1 figure is allowed.
- References should not exceed a maximum of 10.
- A title page must be provided.

B. MANUSCRIPT SUBMISSION

ORGANIZATION OF THE MANUSCRIPT

- The submitted manuscript must be typed double-spaced throughout and numbered (including references, tables and figure legends). Preferably using a "standard" font (we prefer Times/Arial 12).
- For mathematical symbols, Greek letters, and other special characters, use normal text. The references must be in accordance with the Vancouver reference style (see References).
- Approved nomenclature for gene and protein names and symbols should be used, including appropriate use of italics (all gene symbols and loci, should be in italics) and capitalization as it applies for each organism's standard nomenclature format, in text, tables, and figures.
- Full gene names are generally not in italics and Greek symbols are not used. Proteins should not be italicized.
- Improperly prepared manuscripts will not be entered into the peer review process and will be sent back to the author for correction.

TITLE PAGE MUST CONTAIN:

- A title of no more than 130 characters.

- Running title (not to exceed 60 characters)
- Names of the Authors as it should be published (first name, middle initial, last name)
- Affiliations of all authors and their institutions, departments, or organizations (use the following symbols in this order to designate authors' affiliations: *, †, ‡, §, ¶, ||, #, **, ††, ‡‡, §§, ¶¶, || ||, ##).
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- Electronic word count.
- Number of figures and tables.
- List of abbreviations in the order of appearance.
- Conflict of interest.
- Financial support.

Animal trials: Manuscripts reporting experiments using animals must include a statement giving assurance that all animals received human care and that study protocols comply with the institution's guidelines. Statistical methods used should be outlined.

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REFERENCES

References must be in accordance with the Journal of Hepatology reference style. References are ordered as they appear in the text and citation numbers for references are placed between "brackets" ("[]") in the text as well as in the reference list.

Authors should be listed surname first, followed by the initials of given names (e.g. Bolognesi M). If there are more than six authors, the names of the first six authors followed by et al. should appear.

Titles of all cited articles are required. Titles of articles cited in reference list should be in upright, not italic text; the first word of the title is capitalized, the title written exactly as it appears in the work cited, ending with a full stop. Journal titles are abbreviated according to common usage, followed by Journal years, semicolon (;) before volume and colon (:) before full page range (see examples below).

All articles in the list of references should be cited in the text and, conversely, all references cited in the text must be included in the list.

Personal communications and unpublished data should be cited directly in the text by the first Author, without being numbered. Please make sure you have the latest, updated version of your reference management software to make sure you have the correct reference format for Majmaah Journal of Health Science.

An example of how references should look within the text:

"HVPG was measured by hepatic vein catheterization using a balloon catheter according to a procedure described elsewhere [14, 15] and used as an index of portal hypertension [16]."

An example of how the reference list should look:

[14] Merkel C, Bolognesi M, Bellon S, Zuin R, Noventa F, Finucci G, et al. Prognostic usefulness of hepatic vein catheterization in patients with cirrhosis and esophageal varices. *Gastroenterology* 1992;102:973-979.

[15] Groszmann RJ, Wongcharatrawee S. The hepatic venous pressure gradient: anything worth doing should be done right. *Hepatology* 2004;39:280-282.

FIGURES

A maximum of 4 figures is allowed

(This can be modified if needed by Editorial board).

- Figures will be often, but not always, re-designed by graphic designers. By signing and transferring the Copyright Agreement to MJHS, the author gives permission to the graphic designers to alter the visual aspect of any figures, tables, or graphs. The scientific content of figures will not be altered. Please provide this information with your covering letter.
- All graphics submitted to Majmaah Journal of Health Science should be sent at their actual size, which is 100% of their print dimension and in portrait orientation.
- Two standard widths are used and figures should fit in one (8.5 x 23.5 cm) or two (17.5 x 23.5 cm) columns
- Figures should be supplied in the following preferred file formats: PDF (*.pdf), Power Point (*.ppt), Adobe Illustrator (*.ai, *.eps), Photoshop (*.psd) files in grayscales or in RGB color mode. It is highly recommended that figures not be sent in JPG (*.jpg) format.
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- Illustrator compatible EPS files with RGB color management (*.eps),
- Photoshop (*.psd) or PDF (*.pdf) files (grayscales or RGB) at the appropriate resolution, which is:
 1. 300 dpi for color figures
 2. 600 dpi for black and white figures
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- For all photomicrographs, where possible, a scale should appear on the photograph. Photographs of identifiable patients should be accompanied by written permission to publish from patient(s).
- Furthermore, panel lettering should be in Arial bold 14 pt, capitalized and no full stop (A, B) while lettering in figures (axes, conditions), should be in Arial 8 pt, lower case type with the first letter capitalized and no full stop. No type should be smaller than 6 pt.

TABLES

A maximum of 4 tables is allowed

(This can be modified if needed by Editorial board)

- Tables should be provided as Word files (*.doc) or Illustrator/InDesign (*.ai, *.eps, *.indd) compatible files. No TIFF and JPG files are acceptable for table submission.
- When submitting tables in Microsoft Word table function, no tab, space or colors should be used. Tables should contain a maximum of 10 columns.
- Tables submitted in landscape orientation will not be accepted. Tables should include a title, table legend, and if necessary footnotes.
- Include tables in the submitted manuscript as a separate section.

FIGURE LEGENDS

- Figure legends should be listed one after the other, as part of the text document, separate from the figure files.
- Please do not write a legend below each figure. Each figure legend should have a brief title that describes the entire figure without citing specific panels, followed by a description of each panel, and the symbols used.
- Enough information should be provided in the figure legend text to permit interpretation of figures without reference to the text; but should not contain any details of methods, or exceed 100 words.
- The abbreviated word for figure "Fig." should be typed and bolded, followed by the figure number and a period

(i.e. "Fig. 1."). Every figure legend should have a Title written in bold.

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Authors may be asked to contact professionals regarding the correction of the English content of manuscripts either before or after acceptance. This expense will be the responsibility of the Authors.

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Authors should be aware that manuscripts will be screened upon submission. Only the manuscripts which fully comply with the submission requirements outlined and in which the level of English is of an acceptable standard will enter the peer review process.

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Once successful submission of a manuscript has taken place, an acknowledgement will be sent by e-mail to the Corresponding Author on the manuscript. All subsequent correspondence will be with the designated Corresponding Author. The number of the manuscript should be used by the Authors in all communications with the Editorial Office. All the manuscripts will be reviewed by the Editors and, in some cases, by other expert reviewers. After review, the corresponding Author will be notified by letter of the decision taken by the Editor(s). This letter will be accompanied in most, but not all, cases by the comments of the reviewers. This letter will be sent via e-mail.

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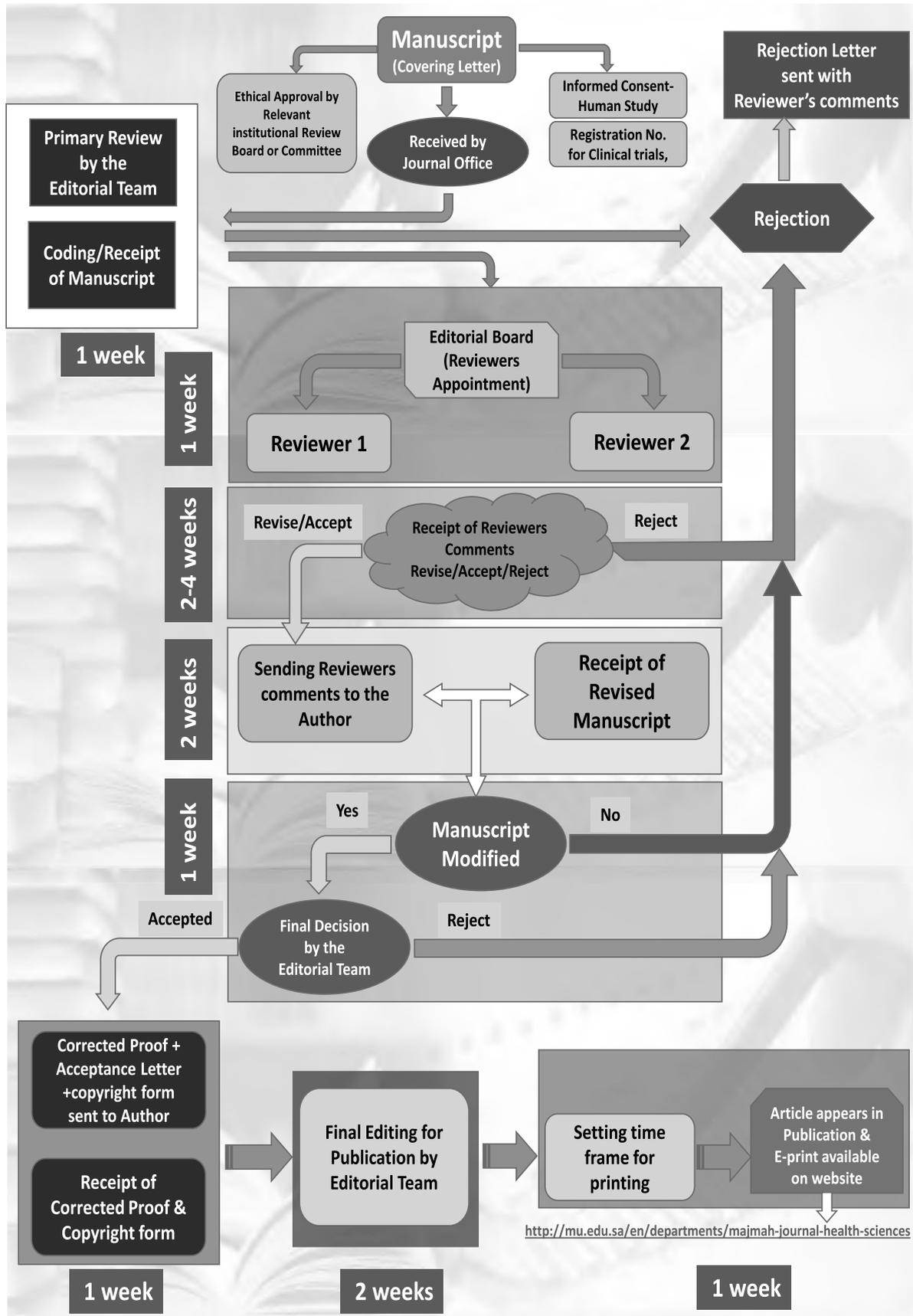
The manuscripts should include a complete and detailed description of what was done. This includes a description of the design, measurement and collection of data, the study objective and major hypotheses, type and source of subjects, inclusion and exclusion criteria and measures of outcome, number of subjects studied and why this number was chosen. Any deviation from the study protocol should be stated. The baseline characteristics of any compared groups should be described in detail and -if necessary -adjusted for in the analysis of the outcome.

For randomized clinical trials the following should also be clearly documented: treatments, sample size estimation, method of random allocation and measures taken for maintaining its concealment including blinding, numbers treated, followed-up, being withdrawn, dropping out, and having side effects (numbers and type). The statistical methods used should be relevant and clearly stated. Special or complex statistical methods should be explained and referenced.

Complex analyses should be performed with the assistance of a qualified statistician. Unqualified use of such analyses is strongly discouraged. The underlying assumptions of the statistical methods used should be tested to ensure that the assumptions are fulfilled.

For small data sets and if variable distributions are non-normal, distribution free (non-parametric) statistical methods should be used. The actual p values - whether significant or not - should always be presented (not NS). Confidence intervals convey more information than p values and should be presented whenever possible. Continuous variables can always be summarized using the median and range which are therefore preferred. Only in the infrequent case of a Normal distribution are the mean and standard deviation (SD) useful. Complex analyses (including Cox and logistic regression analysis) should be presented in sufficient detail: i.e. variable scoring, regression coefficients, standard errors and any constants. Odds-ratios or relative risks are not sufficient documentation of such analyses. The handling of any missing values in the data should be clearly specified. The number of statistical tests performed should be kept at a minimum to reduce spurious positive results. Explorative (hypothesis generating) analyses without confirmation using independent data are discouraged. Figures showing individual observations e.g. scatter plots are encouraged. Histograms may also be useful. Tables should indicate the number of observations on which each result is being based





GPH2018-Fourth International Conference on Global Public Health 2018

Conference

13th to 15th June 2018
Colombo, Sri Lanka

Website: <http://www.health3000.org/>

Contact person: Prabhath Patabendi

"Global Outbreaks –Issues & Challenges" Global Public Health 2018 is held every 1-3 years by the International Center for Research & Development, Sri Lanka and it attracts between 100-150 delegates from 35-50 countries.

Organized by: International Center for Research & Development

Blockchain in Healthcare Congress

Conference

3rd to 4th May 2018
London, United Kingdom

Website: <http://www.global-engage.com/event/blockchain-congress/>

Contact person: Laura Berry

Over two days, the congress will address some of the most achievable possibilities of integrating blockchain within healthcare.

Organized by: Global Engage

Deadline for abstracts/proposals: 3rd April 2018

4th International Academic Conference on Medical and Health Sciences

Conference

9th to 10th April 2018
Al- Rigga Road Deira, United Arab Emirates

Website: <http://medsciences.education/4th-international-academic-conference-on-medical-and-health-sciences/>

Contact person: Mr. David

The 4th International Academic Conference on Medical and Health Sciences is the best interdisciplinary platform for the presentation of new advances and research results in the fields of Medical and Health Sciences.

Organized by: Academic Conferences

Deadline for abstracts/proposals: 15th March 2018

The 5th Annual Arab Paediatric Medical Congress

Conference

8th to 11th February 2018

Dubai, United Arab Emirates

Website: <http://go.evvnt.com/164704-0>

Contact person: Sara Ahmed

The 5th Annual Arab Paediatric Medical Congress is the region's biggest platform where experts and key opinion leaders share their experiences about paediatrics and neonatology. Time: 8:00 am to 5:00 pm

Organized by: Maarefah Management

PUBLIC HEALTH '18 / II. International Conference on Public Health

Conference

16th to 17th March 2018

Istanbul, Turkey

Website: <https://www.dakamconferences.org/public-health>

Contact person: Ozgur Ozturk

All of the presented papers will be published in the proceedings e-book (with an ISBN number), which will be given to you in a DVD box and will be sent to be reviewed in the "Thomson & Reuters WOS' Conference Proceedings Citation Index-CPCI".

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Event Serial -121255

Website <http://theires.org/Conference2018/SaudiArabia/1/ICMHS/>

Contact Person - Conference Coordinator

Event Enquiries Email Address - info@theires.org

Deadline For Abstracts/Proposals: 2017-12-15

Organized By: The IRES

Venue: Mecca, Mecca, Saudi Arabia

RW- 347th International Conference on Medical and Biosciences (ICMBS)

Event Serial -135740

Website <http://researchworld.org/Conference2018/SaudiArabia/2/ICMBS/>

Contact Person - Conference Coordinator

Event Enquiries Email Address - info@researchworld.org

Deadline For Abstracts/Proposals: 2018-02-18

Organized By: Research World

Venue: Dammam, Dammam, Saudi Arabia

International Conference of Medicinal Plants Research (ICMPR-2018)

Conference

26th to 26th March 2018

Warsaw, Poland

Website: <http://www.icmpr.org>

Contact person: Peyman Zare

Our aim is to provide connection of the most acclaimed professionals and researchers in a friendly environment. A travel Grant of 200€ has been assigned to the young researchers and students with best presentations. Registration Fee: 150-190€

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Single Cell Analysis & Point-of-Care Diagnostics

Conference

15th to 16th February 2018
San Francisco, CA, United States of America

Website: <http://www.triconference.com/Single-Cell-Analysis/>

Website: <http://www.triconference.com/point-of-care/>

Contact person: Lisa Scimemi

Innovators and early adopters will present single cell omics case studies and therapeutic applications in genomics, transcriptomics, and proteomics. Focus will be given to cell heterogeneity, method standardization, and data analysis

Organized by: Cambridge Healthtech Institute

Collaborative 3D Printing in Medical Practice

Conference

23rd to 25th February 2018
Scottsdale, United States of America

Website: <http://go.evvnt.com/153859-0>

Contact person: Department of Radiology CME Office

Collaborative 3D Printing in Medical Practice is designed to update and introduce radiologists, surgeons, dentists, and biomedical engineers on uses of 3D printing of anatomic models. Time: 1:00 pm to 12:00 pm

Organized by: Mayo Clinic

Deadline for abstracts/proposals: 23rd February 2018

European Clinical Case Report Congress (EUCCR-2018)

Conference

21st to 22nd April 2018
Vienna, Austria

Website: <https://eutranslationalmedicine.org/euccr-2018>

Contact person: Sandra Oberhuber

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