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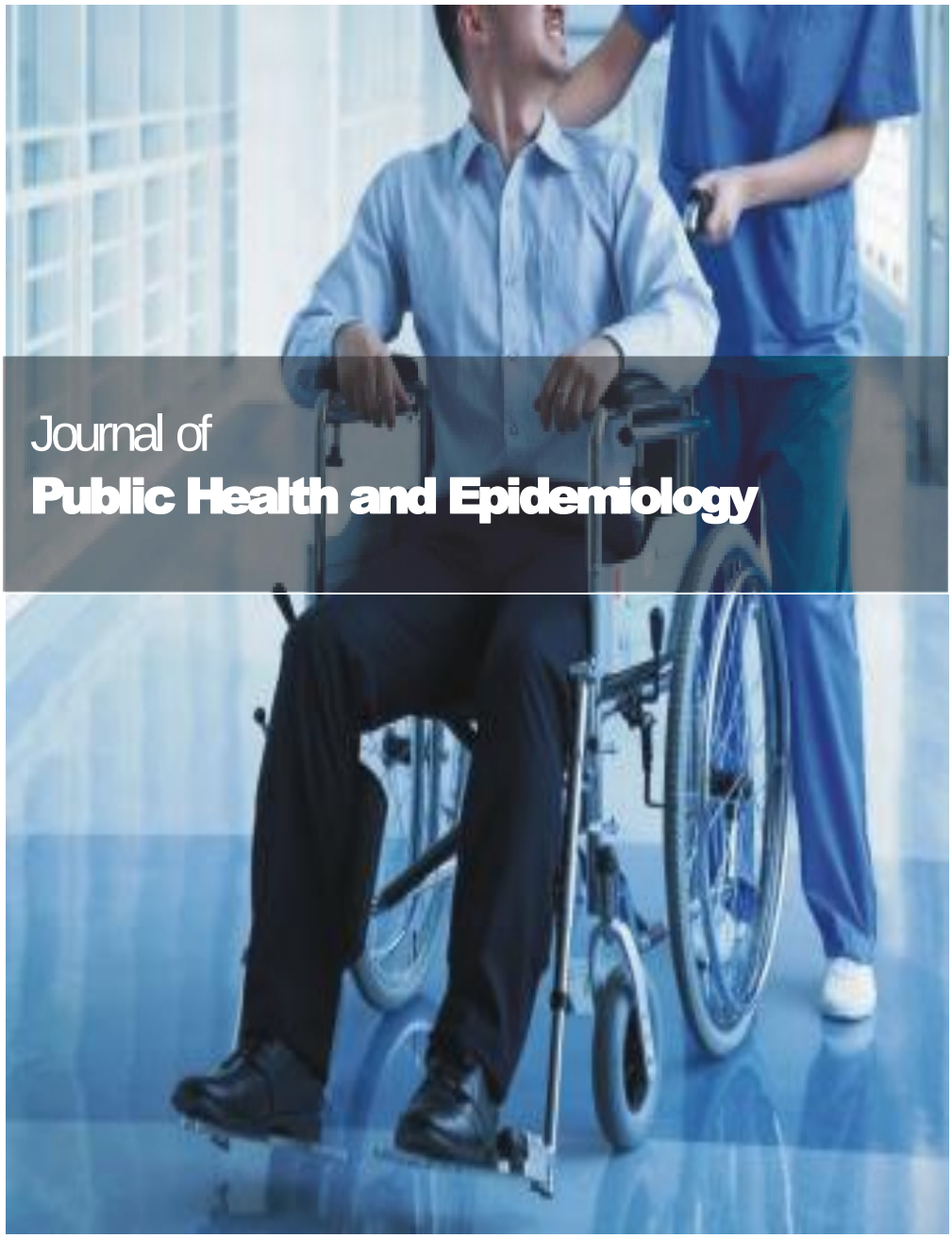

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Journal of Public Health and Epidemiology

Full Length Research Paper

Vitamin-D deficiency and insufficiency and quality of life in Jeddah, KSA: Is there any evidence of association

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Vitamin D (VD) deficiency and insufficiency have been linked to poor quality of life (QoL); general weakness, fatigue, and nonspecific pain. Despite abundance of sun light, there is a wide spread VD deficiency in the Arabian Gulf countries. However, the impact of VD deficiency on the quality of life has not been well documented in the Arabian Gulf countries, including the Kingdom of Saudi Arabia (KSA). This study aims to analyze the effect of crude vitamin D levels on quality of life in none pregnant Arab women in the Kingdom of Saudi Arabia (KSA). The study was a prospective cross sectional study, using a sample of 152 subjects of patients aged 13 years and above attending the outpatients' clinic at King Faisal Hospital, Kingdom of Saudi Arabia (KSA). The study collected anthropometric and demographic variables, in addition to a small plasma sample from all subjects to measure VD levels, calcium (Ca), phosphorus (P), parathyroid hormone (PTH) and lipid profile by standard methods. Subjects were categorized according to VD levels as normal (>30 ng/ml), insufficiency (21 to 29 ng/ml), or deficient (≤ 20 ng/ml). The RAND Short Form -36 (SF-36), which consists of 36 questionnaire items was used to measure (QoL) across eight domains for both physically and emotional wellbeing: physical functioning; role limitations due to physical health; role limitations due to emotional problems; energy/fatigue; emotional well-being; social functioning; pain and general health. Logistic regression analysis was used to investigate the associations between VD levels and QoL. The mean scores in the total sample were 65.5 (SD ±14.6) for the physical component summary (PCS) score and 58.2 (SD ±15.2) for the mental component summary score (MCS). Vitamin D deficiency was overwhelmingly high among subjects across age and sex. The PCS and MCS QoL scores were also lower than the average. However, the study found no association between VD levels and QoL, presumably due to sample size and con-founders. Further studies are needed to identify the impact of VD levels on perceived QoL.

Key words: Vitamin D, poor quality of life (QoL), kingdom of Saudi Arabia (KSA), physical component summary (PCS).

INTRODUCTION

Vitamin D refers to a group of fat-soluble secosteroids responsible for increasing intestinal absorption of

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calcium, iron, magnesium, phosphate, and zinc. The most important compounds in this group are vitamin D3 (also known as cholecalciferol) and vitamin D2 (ergocalciferol) (Holick, 2006).

The term 'vitamin D' specifically refers to two very similar vitamin forms. The first form, known as Vitamin D2 is obtained from the ultraviolet (UV) irradiation of the yeast sterol ergosterol and is found naturally in some sun-exposed mushrooms. The second form, vitamin D3, also known as cholecalciferol, is created by skin cells in response to the sun light or ultraviolet-B (UVB) light. UVB strikes the skin, and humans synthesize vitamin D3 which is considered as the most “natural” form. Unlike vitamin D3, human beings do not make vitamin D2, but most oil-rich fish such as salmon, mackerel, and herring contain vitamin D3.

Both forms of vitamin D ingested, is combined into chylomicrons, which are absorbed into the lymphatic system and enter the venous blood. Evidence shows that vitamin D, whether from the skin or diet, is biologically inactive and requires its first hydroxylation in the liver by the vitamin D-25-hydroxylase (25-OHase) to 25(OH) D (Ecemis and Atmaca, 2013; Holick, 2011). However, 25(OH) D requires a further hydroxylation in the kidneys by 25(OH)D-1-OHase (CYP27B1), to form the biologically active form of vitamin D 1,25(OH)2D (Ecemis and Atmaca, 2013; Holick, 2007). The latter, 1,25(OH)2D, is known to stimulate intestinal calcium absorption (Mithal and Kaur, 2012). Accumulated evidence shows that without vitamin D, only 10 to 15% of dietary calcium and about 60% of phosphorus are absorbed (Mithal and Kaur, 2012). The same evidence shows that vitamin D sufficiency enhances calcium and phosphorus absorption by 30 to 40% and 80%, respectively (Li et al., 2004; Ecemis and Atmaca, 2013).

It is thus clear that, the major role of vitamin D is to maintain normal blood levels of calcium and phosphorus. Sufficient levels of vitamin D are essential to help the body to absorb calcium, which forms and maintains strong bones. It is used alone or together with calcium to improve bone health and decrease fractures. Vitamin D may also protect against osteoporosis, high blood pressure, cancer, and other diseases. 1,25(OH)2D is known to have many protective features, such as the inhibition of cellular proliferation and inducing terminal differentiation, inhibiting angiogenesis, stimulating insulin production, inhibiting renin production, and stimulating macrophage cathelicidin production (Zittermann, 2006; Dawodu et al., 1998; Elshafie et al ., 2012; Ardawi et al., 2012).

Vitamin D deficiency (VDD), or hypovitaminosis D, can result from inadequate nutritional intake of vitamin D, inadequate sunlight exposure (in particular sunlight with adequate UVB), disorders limiting vitamin D absorption, and conditions impairing vitamin D conversion into active metabolites - including certain liver, kidney, and hereditary disorders (Holick, 2011). VDD is defined by the Institute of Medicine (IOM) as a 25(OH) D of less than 0.8 IU. Vitamin D insufficiency is defined by IOM as a 25(OH) D of 21–29 ng/mL (Holick, 2006; Ware and Sherbourne, 1992; Lee et al., 2008). Deficiency impairs bone mineralization, leading to bone softening diseases as rickets in children and osteomalacia and osteoporosis in adults (Holick, 2011).

In children, vitamin D deficiency causes rickets, which is a softening or weakening of the bones. In adults, vitamin D deficiency can lead to osteomalacia, which causes weak bones and muscles. Rickets and osteomalacia are classic vitamin D deficiency diseases. People who may be at a high risk for vitamin D deficiency include those who are elderly or obese, those with limited sun exposure, and babies who are exclusively breastfed. People who have conditions such as cystic fibrosis (mucus build-up in the lungs) or inflammatory bowel disease are also known to be at risk for vitamin D deficiency. VDD is common in Australia, the Middle East, India, Africa, and South America (Holick, 2006; Tomaschitz et al., 2010; Vaidya and Williams, 2012). Pregnant and lactating women who take a prenatal vitamin and a calcium supplement with vitamin D remain at high risk for VDD (Zittermann, 2006; Chowdhury et al., 2009; Pittas et al., 2007).

In addition the deficiency of VD has been associated as a surrogate marker in the aetiology of many chronic diseases including asthma, high blood pressure, diabetes mellitus, hyperlipidemia, cardiovascular disorders (Holick, 2006), and osteoporosis (Lee et al., 2008). Evidence shows that VDD and insufficiency may be more common in women, especially, in the premenopausal state than previously thought and it may impair quality of life (QoL) (Li et al., 2004).

Evidence shows that obtaining sufficient vitamin D from natural food sources alone may be difficult. The consumption of vitamin D-fortified foods and exposure to some sunlight are essential for maintaining a healthy vitamin D status. Evidence also shows that dietary supplements might be required to meet the daily need for vitamin D in some groups of people (Vaidya and Williams 2012).

Little is known regarding the effect of vitamin D supplementation on quality of life. The literature regarding the relation between VD deficiency and insufficiency and the quality-of-life or the outcomes from vitamin D supplementation in healthy and clinical populations is not conclusive. Generally, the quality of life (QoL or QOL) is defined as the perceived quality of an individual's daily life, that is, an assessment of their well-being or lack of wellbeing thereof. This includes all emotional, social, and physical aspects of the individual's life. In health care, health-related quality of life (HRQoL) is an assessment of how the individual's well-being may be affected over time by a disease, disability, or disorder, such as VD deficiency and insufficiency (Holick, 2006; Lee et al., 2008).

Similar to other psychometric assessment tools, a number of health-related QoL questionnaires that meet

certain quality criteria, most importantly with regard to their reliability and validity, are available for use. The most important validated health-related quality of life questionnaires that suit the needs of various illnesses are: the RAND short form (SF-36), which include 36 questions; and, disease, disorder or condition specific instruments (e.g. the King's Health Questionnaire (KHQ) or the International Consultation on Incontinence Questionnaire-Short Form (ICIQ-SF), etc. Evidence shows that QoL ratings are beneficial for both patents and healthcare practitioners, to gauge improvements in health and wellbeing, following interventions such as VD supplementation among patients.

In the Arabian Gulf countries, chronic diseases are epidemic. Substantially low VD levels, much lower than those found in European, were reported among women (Tomaschitz et al., 2010), men and women (Vaidya and Williams, 2012; Zittermann, 2006) and healthy adolescents (Chowdhury et al., 2009). This is attributed, in part to ageing, obesity, sedentary lifestyle, illiteracy, poor dietary vitamin D supplementation, and despite its abundance, poor exposure to sunlight (Ardawi et al., 2012). However, little is known about the relationship between VD deficiency and insufficiency and QoL in the Gulf Arab population. We hypothesize that adequate supplementation of VD among patients with VD deficiency and insufficiency may improve quality of life.

The aim of this study was to measure and assess relationships of serum 25-hydroxyvitamin D [25(OH)D] with quality of life in children, men and non-pregnant women, using (SF-36) and a number of anthropometric measures to examine whether emotional and physical performance, are related to VD deficiency and insufficiency. The study objectives included:

1. Investigate the prevalence of VDD and VD insufficiency among the sample population, using ELISA to measure serum 25(OH) D.
2. Measure and investigate obesity, BP and blood insulin resistance among the sample patients population.
3. Measure and assess quality of life (QoL) among patients, using RAND Short Form (SF-36) for quality of life, across 8 domains of emotional and physical activity.
4. To quantify and analyze the effect of crude vitamin D levels on quality of life among men and none pregnant Arab women.

MATERIALS AND METHODS

Ethical statement

The protocols of this study were approved by the Ethical Review Committees at King Faisal Hospital, KSA. All subjects gave an informed consent prior to their participation.

Study design

The study is a cross sectional study, conducted in the outpatients' clinic of King Faisal Hospital, Kingdom of Saudi Arabia (KSA) during the 2013.

Subjects

Subjects were 152 male and female patients, aged 13 years and above, reporting to the outpatients' clinics of King Faisal Hospital in KSA during 2013. The study patient population was composed of two groups of subjects: juveniles of 13 to 18 years age and adults, 19 years and above, presented with VD deficiency and insufficiency and no pregnancy.

Inclusion criteria

Healthy individuals, juveniles of 13 to 18 years old and adults, with weakness, fatigue and nonspecific pain with 25-hydroxyvitamin D (25-OHD) levels: ≤ 20 ng/ml (VD deficient), 21 to 29 ng/ml (VD insufficient) and ≥ 30 ng/ml (VD sufficient).

Exclusion criteria

Pregnant women (before or during the study) and women with an abnormal level of serum parathyroid hormone (PTH) (>55 pg/ml) and serum calcium (> 10.4 mg/dl), known to have illnesses such as granuloma forming disorder (e.g. Tuberculosis), lymphoma, sarcoidosis or any type of cancers were excluded. Subjects on vitamin D supplementation or any forms of calcitriol (1,25 $(OH)_2 D_3$) were also excluded.

Anthropometric measurements

Qualified research nurses were trained to assist subjects in completing self-reported questionnaires. Nurses measured the height, weight, and waist circumference of participant patients by a calibrated electronic scale with mounted stadiometer from Seca (Model 769; Seca, Hamburg, Germany).

Before taking the measurements, all subjects were asked to wear light clothing and no shoes. Thereafter, subjects were instructed to stand straight with their heads, backs and buttocks vertically aligned to the height gauge. Measurements of height and weight were taken and rounded to the nearest 0.5 cm and 0.5 kg, respectively. The standard tape was used to measure waist circumference (WC) at a point immediately above the iliac crest on the midaxillary line, at minimal respiration and round it to the nearest 1.0 cm.

Overall, three separate measurements of height, weight, and WC were recorded for each participant and averaged for analysis to increase precision. Body mass index (BMI), the ratio of weight to height squared [Weight (kg)]/ [height (m)] ^{2} was calculated. Subjects with (BMI < 20 kg/m^2), BMI 20 < 25 kg/m^2), (BMI of 25 to 30 kg/m^2) and BMI >30 kg/m^2 were classified as underweight, normal weight, overweight and obese, respectively.

Blood sampling and methods of analysis

A 10 ml venous blood was collected after 12 h of an overnight fasting. The blood samples were collected by a registered staff nurse using vacutainer system from Becton Dickinson with 20 G needles (USA). The blood samples were divided into two tubes; plasma EDTA (5 ml) and Serum (5 ml) and were immediately centrifuged by 3000 g/15 min at 4°C within 2 h. Samples were separated, alliqouted, and stored in deep freezers (-80°C) for analysis. Plasma was sued to measure lipid profile, and FBS,

Table 1. Characteristics of participant subjects with SF-36 physical and mental component summary scores in a convenient sample of subjects with symptoms of VD deficiency (n=151), by sex in KSA.

Variable	Males (n=33)		Females (n=119)		Significance
	Mean	Std. Dev.	Mean	Std. Dev.	P <
Age (years)	38.9	10.4	33.9	8.5	0.0030
Height (meters)	1.7	0.1	1.6	0.2	0.0010
Weight (kg)	80.0	15.7	67.3	16.7	0.0010
BMI (kg/m2)	27.1	5.1	26.7	5.9	0.3780
SBP (mmHg)	126.9	14.4	117.4	13.5	0.0010
DBP (mmHg)	77.8	10.6	71.5	8.0	0.0010
Vitamin D (ng/ml)	14.1	8.6	13.5	7.9	0.3450
Calcium (mg/dl)	2.2	0.3	2.3	0.2	0.8440
Phosphate (mg/dl)	1.2	0.3	1.2	0.3	0.3950
PCS (score)	68.3	13.3	64.4	15.1	0.0900
MCS (score)	60.3	13.3	57.3	15.7	0.1610
PCS_p (score % ile)	56.1	28.5	47.9	29.8	0.0790
MCS_p (score % ile)	53.3	28.1	47.4	30.6	0.1590

whereas, serum was used to measure HBA1c, calcium (Ca), PTH, 25(OH) D3, and insulin.

Homeostasis model assessment of insulin resistance (HOMA-IR) was calculated based on pairing FBS and Fasting Blood Insulin to establish a measure for insulin resistant: HOMA-IR = [{FBS (mmol/L)} * {Insulin (IU per ml)}/22.5]. ELISA was used to measure serum 25(OH) D. All tests and analysis were carried out by the Clinical Diagnostic Laboratory, at King Faisal University.

Quality of life

The study used the RAND Short Form-36 (SF-36), a 36 item questionnaire to measure quality of life (QoL) across eight domains of physical and emotional wellbeing: physical functioning; role limitations due to physical health; role limitations due to emotional problems; energy/fatigue; emotional well-being; social functioning; pain and general health.

Data was converted in a two stage manner. First, each question response was related to the corresponding pre-coded numeric value. Secondly, scores were translated and the average for each of the eight scale components was calculated. Moreover, the study summarized the physical QoL (Physical Component Summary; PCS) from the corresponding physical activity components. Similarly, emotional QoL (Mental Component summary; MCS) was calculated as the average of the relevant mental health components. Finally, a z-score was calculated for each of these two components to transform the data into percentile.

Statistical analysis

STATA software version 13 was used for data analysis. Descriptive and inference analysis using the t-test, where applicable, were carried out. To compare categorical variables, the study used the Chai square test and the Fisher exact test, wherever appropriate, to analyze the data.

Multivariate logistic regression was used to identify independent correlates between VD-levels and QoL measured by PCS and MCS scores. A p-value < 0.05 was used as the statistical significance level.

RESULTS

The socio-demographic characteristics of participant subjects (n=152) are summarized, according to sex in Table (1). Overall, 21% of participants were males and the majority (79%) was females (Table 1). The mean age of male patients was 38.9 years while the mean age among female patients interviewed was 33.9 years (p=0.003).

The mean BMI among male patients was 27.1 compared to 26.3 among females but the difference was not significant. There were significant differences in SBP and DBP, though both were within the normal range. The mean age, height and weight of males were significantly higher than those of females (Table 1).

The analysis of the QoL physical component summary (PCS) from the corresponding physical activity components and the emotional QoL mental component summary (MCS) from the relevant mental health components showed that, the mean scores in the total sample were 65.5 (SD ±14.6) for PCS and 58.2 (SD ±15.2) for MCS.

The linear regression analysis did not show any significant relationships between VD levels and both PCS and MCS scores (Table 2). However, when vitamin D was categorized as insufficient, deficient, or normal, it was observed that subjects with normal levels of VD have had higher mean PCS scores, but the pattern is not similar for the equivalent MCS scores (Figures 1 and 2).

DISCUSSION

As stated earlier, a sizeable evidence shows that VD deficiency and insufficiency are widely prevalent in the worldwide and are commonly thought to be re sponsible

Table 2. Regression Analysis of participant VD Levels in relation to their SF-36 physical and mental Component Summary Scores in a convenient sample population with symptoms of VD deficiency, in KSA, (n=151).

Variable	PCS Coefficient	Std. Err.	t	P>t	[95% CI]	
Vit D	-0.0908403	0.1666315	-0.55	0.587	-0.4206772	0.2389966
Ca	13.63594	7.144335	1.91	0.059	-0.5058307	27.77771
Phos	2.426792	5.840301	0.42	0.678	-9.133727	13.98731
Age	0.0467787	0.1626683	0.29	0.774	-0.2752132	0.3687706
Sex	-2.617402	3.46636	-0.76	0.452	-9.478849	4.244044
BMI	-0.2991213	0.2339425	-1.28	0.203	-0.7621962	0.1639535
SBP	0.1200567	0.1258418	0.95	0.342	-0.1290393	0.3691528
DBP	-0.0704202	0.1857145	-0.38	0.705	-0.4380306	0.2971902
Cons	35.12833	28.45274	1.23	0.219	-21.19213	91.44879

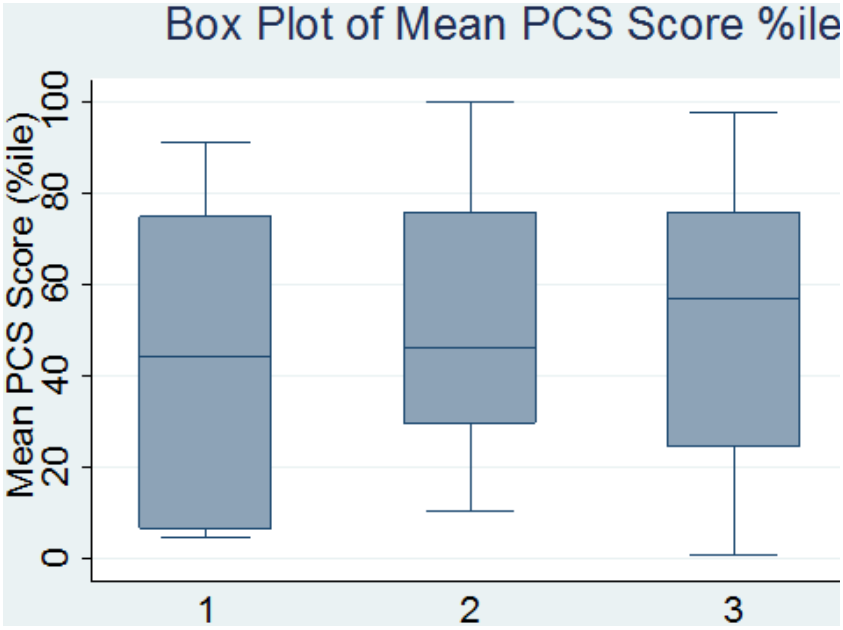

Figure 1. Shows the difference between the mean PCS percentile score in subjects with insufficiency (1), deficiency (2) and normal VD levels.

for a variety of chronic disease states, including diabetes, cancer, and depression. Routine vitamin D supplementation is clearly needed to meet vitamin D requirements, but little is known so far regarding the effect of vitamin D supplementation on quality of life.

This study attempted to measure and assess relationships of serum 25-hydroxyvitamin D [25(OH)D] (Ecemis and Atmaca, 2013; Holick, 2007) with quality of life in children, men and non-pregnant women in KSA, using (SF-36) and a number of anthropometric measures to examine whether emotional and physical performance, are related to VD deficiency and insufficiency. The study showed that an overwhelming majority of participant focuses on those that had clear VD deficiency. Similar findings were previously reported in the Arabian Gulf countries despite the abundance of sunlight, the major source for VD.

Although plausible genetic predisposition has been suggested, there is yet no strong evidence of causal factors as such. Nonetheless, we think that lack of adequate sun exposure due to cultural reasons and lifestyle (with limited outdoor activities) may have contributed to such low levels of VD in this population (Holick, 2006). Whether the low levels of VD have led to our findings of low PCS and MCS scores is not very clear from this data. Linear regression analysis was carried out, but still, we were unable to show any association between VD levels and QoL indicators (PCS and MCS), which is possibly due to the small sample size used for the study.

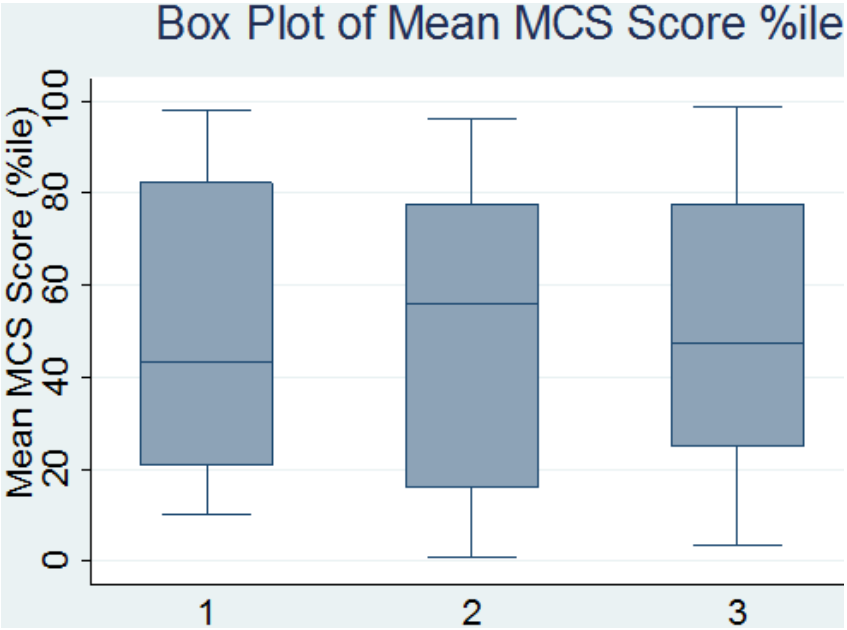

Figure 2. Shows the mean MCS percentile score among the sample population of patients with VD insufficiency (1), deficiency (2) and normal VD levels in KSA.

Interestingly, however, subjects with normal VD levels demonstrated a higher mean of PCS score but not MCS score. Although not affirmative, such finding lends weight to the possibility of association.

Perhaps, the small number of subjects with normal VD levels (5 subjects) have masked, otherwise plausible associations. We also cannot rule out other underlying confounders which may have been out of control. It would be logical therefore, to undertake a further interventional follow up study on the same subjects, after receiving VD supplementation, to investigate whether the changes in VD levels would improve their PCS and MCS scores significantly. We intend to follow up with this line of research and perhaps increase the sample size in the near future.

In summary, although we have shown a significant higher PCS scores among subjects with normal VD levels, we were unable to present solid evidence of the impact of VD deficiency on quality of life of the sample patients. Our finding is consistent with evidence elsewhere. For example a recent systematic review of 15 research articles showed that VD supplementation was not associated with significant changes in quality of life (Li et al., 2004). The review also showed that studies that reported changes in quality of life as a result of vitamin D supplementation were in clinical populations on short-term vitamin D. Most articles reviewed displayed poor methodological quality (e.g. no randomization/blinding, dropout description, or vitamin D assessment) (Mithal and Kaur, 2012; Muhairi et al., 2013).

In conclusion the current evidence indicates that vitamin D supplementation alone may have little impact on the quality of life when used on a short-term basis in patients' populations. It is thus clear that the evidence for the beneficial effect of a long-term vitamin D treatment supplementation on quality of life of patients remains lacking. Our data has many limitations. First, the sample size is small and convenient and as such, may have masked true statistical associations, thus limiting our ability to make adequate inference. Second, the Sf-36 instrument was meant to identify changes in QoL as opposed to a single baseline records.

Conclusion

Vitamin D deficiency was overwhelmingly high among the study subjects across age and sex. The PCS and MCS QoL scores were also found lower than the average levels. However, we found no association between VD levels and QoL, presumably due to our small sample size and the presence of confounders. Further studies are needed to identify the impact of VD levels on perceived QoL among patients in the Arabian Gulf countries.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Journal of Public Health and Epidemiology

Full Length Research Paper

Physical activity levels among Fayoum governorate population (Egypt): Community-based survey

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Physical inactivity is one of the most important public health problems in the 21st century. It plays an active role in the prevention of both non-communicable diseases and premature death. A community-based survey was conducted to assess the level of physical activity among household population and to identify associated demographic factors of physical inactivity. A sample of 5000 households was selected by a multi-stage stratified cluster random sample. A standardized world health organization (WHO) structured questionnaire global physical activity questionnaire (GPAQ) was used in data collection. About 25.2% of the study population practiced a physical activity less than WHO recommended level for their ages. The study has shown statistically-significant insufficient physical activity level among females (31.3%), adolescent (42.6%), the old (57.1%), housewives (38.8%), and the low-income (32.5%), with a P-value of <0.001. The study concluded that Fayoum community practice physical activity less than recommended level by the WHO especially among females, adolescents, elderly, and the low-income households' population. Further studies should be recommended.

Key words: Physical inactivity, recreational activity, global physical activity questionnaire (GPAQ).

INTRODUCTION

Physical inactivity is one of the most important public health problems in the 21st century (Blair, 2009). Physical activity is defined as a bodily musculoskeletal movement which requires energy expenditure. It includes any movement done by the body during playing, traveling, working, and/or doing routine household duties (WHO, 2017). It differs from physical exercise in that the latter is defined as a body activity that maintains fitness and aims to improve health and overall wellness (Kylasov et al., 2011).

Physical activity plays an active role in the prevention of non-communicable diseases, such as coronary heart disease, diabetes mellitus type II, dyslipidemia, obesity, breast and colon cancers in addition to the prevention of dementia, depression, and premature death (Abby et al., 2017). Physical inactivity had a negative impact on global mortalities as it is considered the fourth leading risk factor for global mortalities (CDC, 2014). Insufficient physical activity is defined as practicing physical activity less than 300 min per week of vigorous and moderate intensity with less than 60 min per day for five days per week (De Moraes et al., 2013).

The prevalence of physical inactivity increased in many countries, especially low and middle income with the

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lowest prevalence of 17% in Southeast Asia, and the highest prevalence of 43% in America (WHO, 2017). Physical activity has shown two main levels: the first is the vigorous-intensity activity that causes increases in breathing or heart rate to the limited participant who can't speak more than few words, like carrying or lifting heavy loads, digging, or construction work for at least 10 min continuously, and the second one is the moderate-intensity activity that causes slight increases in breathing or heart rate, and breaks sweat so that the participant is able to talk as brisk walking or carrying light loads for at least 10 min continuously. Sedentary behavior means sitting, watching television, traveling in a car, checking social media though it does not include sleeping hours (Hallal et al., 2012).

Physical activity is affected by different factors, such as age, sex, residence, weight, socio-economic status, family, and peer support (Teng et al., 2014). Physical activity starts from childhood with a gradual increase in frequency, intensity, and duration in order to achieve its positive impact on physical fitness, mental health and to increase self-esteem (WHO, 2016). Regular physical activity associated with proper nutrition improves bone mineralization and skeletal health (Ford et al., 2008).

Recommendations of World Health Organization for children and youth aged 5 to 17 were to spend at least 60 min of moderate to vigorous intensity physical activity per day. For adults aged 18 to 64 and the elderly aged 65 years old or above the recommendations were to spend at least 150 min of moderate-intensity aerobic physical activity, or 75 minutes of vigorous-intensity aerobic physical activity per week (WHO, 2010). Studies that assess the prevalence of global physical activity were deficient. The current study aims to estimate the prevalence of physical activity level in Fayoum community. It also aims to identify associated demographic factors of physical inactivity.

MATERIALS AND METHODS

Study design

This study is a cross-sectional, descriptive, community-based survey conducted to assess the physical activity of the household population in Fayoum governorate-Egypt. Egypt ranks 111th out of 187 countries in the Human Development Index (Human Development Index Report, 2015). Fayoum total population is 2,511,027 according to an Egyptian census conducted in 2006. Fayoum stands among the lowest ranking five governorates. In 2008, it reached the 20th position in Egypt's human development index and remained so for several years. Such a deteriorating situation correlates with some factors on top of which is the high illiteracy rate, poverty, strong traditional beliefs related to the rural community (Human Development Index Report, 2015).

Study sample

The sample was a multi-stage stratified cluster random sample representative for all districts of Fayoum governorate (Tamiyya, Sinnuris, Fayoum, Etsa, Abshaway, and Youssef Seddyq) districts (CAPMAS, 2013).

Study population

The study population sample was done in the following stages: cluster sampling for urban and rural areas in each district; the main primary health care facility in urban areas and health care unit in rural areas were the starting point to identify one population's blocks in each area. A street was randomly chosen in each selected block. Then, the first house was chosen once again randomly. Afterwards, every second house with all its households was included in the study.

Study size

The sample size was calculated according to Epi Info 2000. A sample size of 5000 was selected using a special formula based on the global prevalence of physical inactivity (17.7%) at a confidence interval of 95% and precision of 2%. The stratified and cluster sampling methods had been considered, and the calculated sample size was tripled to achieve the same precision. Finally, the sample increased by 10% to overcome problems related to non-responses and missing data. Ultimately, 5000 persons agreed to be interviewed and to participate in the study with a response rate of 91%.

Study tools

The study was conducted during a period of one year. The households were interviewed with a standardized world health organization (WHO) structured Arabic questionnaire and global physical activity questionnaire (GPAQ) (WHO, 2017). It consists of the following sections:

The first section involved socio-economic data, such as age, sex, residence, educational level, occupation, and income. The second section included questions of the physical activity duration, frequency, and intensity (vigorous or moderate) at work, traveling between places, and recreational physical activities. The third section inquired the duration of sedentary behavior. The last section investigated barriers to physical and recreational activity among the study population.

Statistical analysis

Data were collected, coded; double entered, and analyzed using statistical package for social sciences (SPSS) software (Version 18) under Windows 7. Mean and S.D. were calculated for quantitative variables in the form of simple descriptive analysis. Categorical data was analyzed in computing percentages, and differences were statistically tested by applying chi-square tests for comparisons between groups; P-value of ≤0.05 was considered statistically significant.

RESULTS

Demography

This study was conducted upon 5000 households in Fayoum governorate; 2718 (54.4%) were females and 2282 (45.6%) were males. They were divided into three

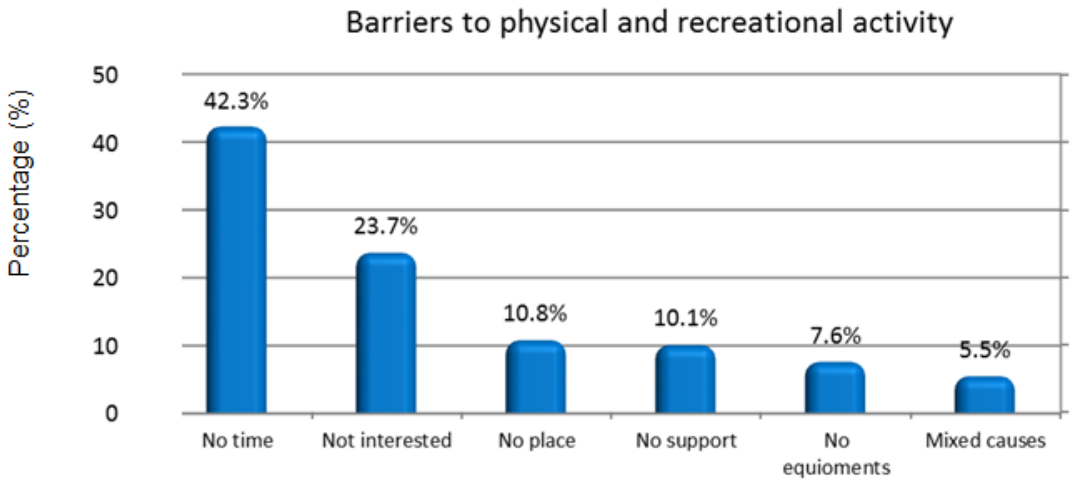

Figure 1. Barriers to physical and recreational activity among survey responders.

age groups: under 17 years old were 376 (7.5%), aged between 18 to 64 years old were 4526 (90.5%), and aged 65 years old and above were 98 (2%).

Socio-economic section

As for their residency more than half of sample, that is, 2608 (52.2%) were inhabitants in rural areas while the other 2392 (47.8%) were from urban areas. In relation to their educational level 653 (13.1%) were illiterate, 2130 (42.6%) passed secondary level, and 2217 (44.3%) received university level. As for occupation, 1740 (34.8%) were employees; 814 (16.3%) worked as professionals, while 1158 (23.3%) were manual workers and 1288 (25.8%) were housewives. With respect to monthly income, more than one third of them 1704 (34.1%) earn less than 500 pounds; half of them 2512 (50.2%) earn between 500 to 2000 pounds monthly and 784 (15.7%) earn more than 2000 pounds monthly.

Inquiring about the time spent in different types of physical activity per week, about half of them which is 2560 (51.2%) mentioned that their work involves vigorous-intensity activity with mean (4.2±1.8) days per week and mean duration of 215.8±102.5 min per day. For moderate intensity activities, 3364 (67.3%) stated that their work involves moderate-intensity activity with a frequency mean (3.7±1.9) days per week and mean duration of (286.5 ±111.2) minutes per day.

Regarding travel between places, 3788 (75.8%) of households stated that they usually walk or use a bicycle for at least 10 minutes continuously with a frequency mean (4.9±1.8) days per week and mean duration of 83.9±54.7 min per day. Around one fourth of them practiced physical activity less than WHO recommended level for age 1261 (25.2%).

The survey included questions about recreational activities. 1580 (31.6%) of households do vigorous-intensity sports fitness, with a frequency mean (1.9±1.2) days per week and mean duration of 143.4±74.1 min per day. While households who do moderate-intensity sports fitness were 1330 (26.6%) with a frequency mean (2.7±1.7) days per week, and mean duration of 122.9±65 min per day. In relation to sedentary behavior, the mean sedentary hours were 10.3 ±2.8 h per day.

Recreational activities

In connection with barriers to physical and recreational activity among survey households, 2042 (42.3%) had no time to practice exercise, 1186 (23.7%) were not interested, 540 (10.8%) did not have suitable place, 504 (10.1%) needed family or friend support, 380 (7.6%) did not have gymnastic equipments and/or tools, and 276 (5.5%) of them had multiple different barriers (Figure 1).

Physical activities

There was statistically significant and high prevalence of vigorous-intensity physical activity at work among males (1638 (64.0%)) and adult age group (2402 (93.8%)). It is clear that the high prevalence was among rural areas inhabitants (1390 (54.3%)) more than it was among urban inhabitants (1170 (45.7%)), households with moderate education level (1165 (45.5%)), workers (959 (37.5%)) and who earn between 500 to 2000 pounds monthly (1388 (54.2%)). There was a statistically significant association between moderate-intensity physical activity at work and in travel between places and socio-demographic characteristics P-value (<0.05), with high prevalence among males 1884 (56%) and 2190 (57.8%) respectively; adult age group 3116 (92.6%) and

Table 1. Association between socio-demographic factors with physical activity at work and in travel between places among the study group.

Variable	Physical activity level in work								
	Vigorous intensity			Moderate intensity			Travel between places		
	Yes	No	P-value	Yes	No	P-value	Yes	No	P-value
	No (%)	No (%)		No (%)	No (%)		No (%)	No (%)	
Sex									
Male	1638 (64)	1080 (44.3)	<0.001	1884 (56)	834 (51)	<0.001	2190 (57.8%)	528 (43.6%)	<0.001
Female	922 (36)	1360 (55.7)		1480 (44)	802 (49)		1598 (42.2%)	684 (56.4%)	
Age groups									
<18 years	122 (4.8)	254 (10.4)		220 (6.5)	15 6 (9.5)		286 (7.6%)	90 (7.4%)	
18-64 years	2402 (93.8)	2124 (87)	<0.001	3116 (92.6)	1410 (86.2)	0.001	3442 (90.9%)	1084 (89.4%)	0.003
≥ 65years	36 (1.4)	62 (2.5)		28 (0.8)	70 (4.3)		60 (1.6%)	38 (3.1%)	
Residence									
Rural	1390 (54.3)	1218(49.9)	0.002	1748 (52)	860 (52.6)	0.695	1982 (52.3%)	626 (51.7%)	0.692
Urban	1170 (45.7)	1222 (50.1)		1616 (48)	776 (47.4)		1806 (47.7%)	586 (48.3%)	
Educational level									
Illiterate	399 (15.6)	254 (38.9)		387 (11.5)	266 (16.3)		443 (11.7%)	210 (17.3%)	
Moderate	1165 (45.5)	965 (45.3)	<0.001	1437 (42.7)	693 (42.4)	<0.001	1610 (42.5%)	520 (42.9%)	<0.001
High	996 (38.9)	1221 (55.1)		1540 (45.8)	677 (41.4)		1735 (45.8%)	482 (39.8%)	
Occupation									
Worker	959 (37.5)	199 (8.2)		801 (23.8)	357 (21.8)		945 (24.9%)	213 (17.6%)	
House wife	476 (18.6)	812 (33.3)	<0.001	748 (22.2)	540 (33)	<0.001	841 (22.2%)	447 (36.9%)	<0.001
Employer	765 (29.9)	975 (40)		1230 (36.6)	510 (31.2)		1372 (36.2%)	368 (30.4%)	
Professional	360 (14.1)	454 (18.6)		585 (17.4)	229 (14)		630 (16.6%)	184 (15.2%)	
Income									
<500 pounds	774 (30.2)	930 (38.1)		1080 (32.1)	624 (38.1)		1204 (31.8%)	500 (41.3%)	
500-2000 pounds	1388 (54.2)	1124 (46.1)	<0.001	1690 (50.2)	822 (50.2)	<0.001	1966 (51.9%)	546 (45%)	<0.001
>2000 pounds	398 (15.5)	386 (15.8)		594 (17.7)	190 (11.6)		618 (16.3%)	166 (13.7%)	

3442 (90.9%) respectively; highly educated 1540 (45.8%) and 1735 (45.8%) respectively; employers 1230 (36.6%) and 1372 (36.2%) respectively and who earn between 500 and 2000 pounds monthly 1690 (50.2%) and 1966 (51.9%) respectively (Table 1). On the contrary, there was

Table 2. Socio-demographic characteristics regarding recreational activities practice among the study group.

Variable	Recreational activities					
	Vigorous intensity sport			Moderate intensity sport		
	Yes	No	Sig.	Yes	No	Sig.
	No (%)	No (%)		No (%)	No (%)	
Sex						
Male	1204 (76.2)	1514 (44.3)	<0.001	948 (71.3)	1770 (48.2)	<0.001
Female	376 (23.8)	19.6 (55.7)		382 (28.7)	1900 (51.8)	
Age groups						
<18 years	166 (10.5)	210 (6.1)		132 (9.9)	244 (6.6)	
18-64 years	1408 (89.1)	3118 (91.2)	<0.001	1194 (89.8)	3332 (90.8)	<0.001
≥ 65years	6 (0.4)	92 (2.7)		4 (0.3)	94 (2.6)	
Residence						
Rural	784 (49.6)	1824 (53.3)	0.015	650 (48.9)	1958 (53.4)	0.005
Urban	796 (50.4)	1596 (46.7)		680 (51.1)	1712 (46.6)	
Educational level						
Illiterate	86 (5.4)	567 (16.6)		76 (5.7)	577 (15.7)	
Moderate	618 (39.1)	1512 (44.2)	<0.001	532 (40)	1598 (43.5)	<0.001
High	876 (55.4)	1341 (39.2)		722 (54.3)	1495 (40.7)	
Occupation						
Worker	424 (26.8)	734 (21.5)		337 (25.3)	821 (22.4)	
House wife	211(13.4)	1077 (31.5)	<0.001	217 (16.3)	1071 (29.2)	<0.001
Employer	607 (38.4)	1133 (33.1)		490 (36.8)	1250 (34.1)	
Professional	338 (21.4)	476 (13.9)		286 (21.5)	528 (14.4)	
Income						
<500 pounds	500 (31.6)	1204 (35.2)		422 (31.7)	1282 (34.9)	
500-2000 pounds	776 (49.1)	1736 (50.8)	<0.001	656 (49.3)	1856 (50.6)	<0.001
>2000 pounds	304 (19.2)	480 (14)		252 (18.9)	532 (14.5)	

no statistically significant association with residence. There was a significant association between socio-demographic characteristics and both the vigorous and moderate intensity recreational activities with P-value (<0.05). Being males, adult age groups, inhabitants in urban areas, and the highly educated who earn between 500 and 2000 pounds monthly were highly associated with practice vigorous and moderate intensity recreational activities with a P value of (0.001, 0.001, 0, 005, 0.001, 0.001, 0.001) respectively (Table 2). In terms of WHO recommendation level for physical activity practice, there was a statistical significance in connection with insufficient physical activity level among females, adolescent, the old, housewives, and the low-income who earn less than 500 pounds per month with an overall P value of (0.001). On the other hand, there was no statistically significant association between insufficient physical activity level with residence and education level P value of (0.454; 0.878) respectively (Table 3).

DISCUSSION

The current study is a pioneering one as it is the first to assess the prevalence of physical activity in Fayoum governorate. It was conducted on 5000 household's community-based survey, with different gender, age, education level, residence, occupation, and income.

With respect to the WHO recommendations on the average level of physical activity practice for different age group, at least 60 min of moderate to vigorous-intensity physical and daily activity were for those below 17 years old; 150 min of moderate-intensity or 75 min of vigorous-intensity aerobic physical activity throughout the week

Table 3. World health organization recommended level of physical activity practice among different study groups.

Variable	WHO recommended level of physical activity		Sig.
	Not adequate	Adequate	
	No (%)	No (%)	
Sex			
Male	546 (20.1)	2172 (79.9)	<0.001
Female	715 (31.3)	1567 (68.7)	
Age groups			
<18 years	160 (42.6)	216 (57.4)	
18-64 years	1045 (23.1)	3481 (76.9)	<0.001
≥ 65years	56 (57.1)	42 (42.9)	
Residence			
Rural	646 (24.8)	1962 (75.2)	0.454
Urban	615 (25.7)	1777 (74.3)	
Educational level			
Illiterate	160 (24.5)	493 (75.5)	
Moderate	541 (25.4)	1589 (74.6)	0.878
High	560 (25.3)	1657 (74.7)	
Occupation			
Worker	102 (8.8)	1056 (91.2)	
House wife	500 (38.8)	788 (61.2)	<0.001
Employer	463 (26.6)	1277 (73.4)	
Professional	196 (24.1)	618 (75.9)	
Income			
<500 pounds	554 (32.5)	1150 (67.5)	
500-2000 pounds	548 (21.8)	196.4 (78.2)	<0.001
>2000 pounds	159 (20.3)	625 (79.7)	

were for both adult age between 18 to 64 years old and elderly people above 65 years old (WHO, 2010).

The current study has shown that about one-fourth of households practice physical activity less than WHO recommended level for age 25.2%. This was much less than the results of a study conducted in Armenia with 53% were physically inactive, and less than Saudi Arabia which was 40.6% (Liana, 2008; AL-Hazza, 2007). However, it was higher than a study conducted in China which concluded that only 0.1% did not meet WHO recommendations (Paul et al., 2005).

The current study shows that insufficient physical activity was high among females more than males. This finding corroborates with studies conducted in Brazil (Gabriela et al., 2013; David, 2015) and in India, which concluded that males were more physically active than females (Gupta et al., 2012) Yet, it disagreed with a study conducted in Nepal which reported that males had a higher prevalence of physical inactivity more than females (Abhinav and Alexandra, 2014).

Around half of adolescents and elderly in the current study did not meet the WHO recommendation level of physical activity. These results were less than the prevalence among elderly in Brazil (80%) (Saulo, et al., 2013), the prevalence of physical inactivity increased over time by aging (Anna et al., 2011). More than half of adolescents did not meet the recommended levels of physical activity, and this proportion tended to increase in Brazil (Samuel et al., 2010; Gabriela et al., 2013). This could be explained in that adolescents and elderly are the dependent age group who were not officially working, as working consider the main domain of physical activity. As for adolescents, they are deeply immersed in an era of electronics, and digitalized devices, screen time dramatically increased among children and adolescents.

This negatively affects physical and recreational

activities. This also matched with a study conducted in Brail, which concluded that electronic equipment negatively affected moderate-to-vigorous physical activity of children and adolescents (Gerson et al., 2015).

One-fourth of adults did not achieve the minimal level of recommended physical activity. Adults show a high prevalence of practicing vigorous to moderate intensity physical activity at work and recreational activities in addition to traveling activity. In Vietnam, around 50% of adult achieved the minimal level of recommended physical activity, and it was mainly achieved through work (Oanh, et al., 2008).

Regarding the educational level, there was a positive association with the physical activity as a high percentage of highly educated personnel stated that they practiced moderate intensity physical activity at work and traveling physically activity in addition to vigorous to moderate-intensity recreational activities, while others with moderate education level practice vigorous intensity physical activity. These results were similar to other studies conducted in some developed countries (Bauman et al., 2012) and matched with Asian HDSS report (Hakimi et al., 2009) as well.

Occupation and low income were associated with physical activity as it was approved by the current study that workers did vigorous-intensity physical activity at work. As for employees, those practiced moderate intensity and traveling physical activity and vigorous to moderate-intensity recreational activities. These results were similar to the finding in India, China, and Vietnam who stated that work was the main domain to achieve physical activity (Ranjit et al., 2014). Yet, it does not agree with the study done in Zurich (Switzerland) which found that many factors were associated with being physically active: one of these was the occupation and personal income (Bauman, et al., 2012).

The current study revealed that rural communities show a high level of vigorous-intensity activities at work, but urban community practice vigorous to moderate-intensity recreational activities. It almost agreed with the results of the worldwide survey which concluded that urban and wealthier countries presented a higher prevalence of physical inactivity (Samuel et al., 2011).

Another study conducted in India concluded that the prevalence of inactivity was higher in urban areas compared to rural areas (Ranjit et al., 2014). As rural areas depend mainly on manual work in agriculture and show a lack of transportation facilities, rural inhabitants have to do vigorous to moderate activities in their work and they also suffer a deficiency in recreational activities. On the other hand, urban areas have facilities to recreational activity and good transportations.

The current study noted that the most common barriers to physical and recreational activities lied in the fact that there was no time to practice exercise, followed by an inactive feeling, no suitable place, no family or friend support, and no gymnastic equipment and tools as well. It is similar to the finding of a study conducted in Germany (Anna et al., 2011). Social support, self-efficacy, and regulation promote physical activity (Chae et al., 2014).

CONCLUSION AND RECOMMENDATIONS

In Fayoum community, the prevalence of physical activity less than recommended by WHO increased among females, adolescents, the elderly, and low-income households. To overcome the high prevalence of physical inactivity, there is a need to develop a multi-sector approach to raise the awareness of the importance of physical activity, its positive impact on health, and global recommendations of physical activity developed by WHO, with particular emphasis on setting a global strategy for a healthy diet.

LIMITATIONS OF THE STUDY

There are several limitations to this study. The study design used a cross-sectional survey design. It was difficult to establish a causal relationship. Self-reported information in the study could be less reliable in detecting physical activities and shows recall bias. The current study did not explore other associated factors, such as the social and environmental factors in detail.

ETHICAL CONSIDERATIONS

This study was reviewed and approved by the Faculty of Medicine Research Ethical Committee. It was conducted after explaining the study objectives and confidentiality which was expressed to the households. Verbal consent was obtained from households before distributing the questionnaire. Each participant had the right not to participate in the study or withdraw at any time.

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Epidemiology of Hepatitis B viral infection among students and non-teaching (casual) staff of Nile University of Nigeria: A 2017 study

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Hepatitis B viral infection is a silent deadly disease. According to the Society for Gastroenterology and Hepatology in Nigeria (SOGHIN), over 20 million persons are infected with hepatitis and death from it is on a large scale. This study was carried out in order to estimate the prevalence of Hepatitis B Virus (HBV) among students and non-teaching staff of Nile University of Nigeria, Abuja. The study was cross-sectional; involving 200 participants (150 students and 50 non-teaching staff) recruited over a period of three months, from the first week of February 2017 to the end of May 2017 and screened for Hepatitis B surface antigen (HBsAg) using One Step Rapid Diagnostic Test. Structured questionnaires were also issued out to the study population. The study revealed that 13 out of the 200 people tested were positive giving an overall prevalence rate of 6.5% (95% CI: 3.0, 10.0%). 3 out of the 150 students were positive and 10 out of the 50 non-teaching staff tested were positive. The prevalence of HBsAg was higher among the non-teaching staff (20.0%) than among students (2.0%). Disaggregated by gender, the prevalence was higher among males (8.9%) than among females (4.0%). The reasons for the difference in prevalence and health implications of these findings are discussed.

Key words: Hepatitis B virus, gastroenterology, students, non-teaching staff, prevalence.

INTRODUCTION

Hepatitis B viral (HBV) infection is a life threatening infection of the liver. It is a major global health problem and people are largely unaware of this disturbing medical issue (World Health Organization (WHO), 2016). Although this infection was discovered more than 50 years ago and a safe and effective vaccine has been available for more than 20 years, the complications of chronic HBV infection remain the cause of significant illness and death in Africa (Emechebe et al., 2009; Davis, 2016; WHO, 2016; Schoenstadt, 2017; Afihene et al., 2015). It is therefore essential to increase the knowledge base and awareness of this clinical entity. Current literature has established that the risk of contracting Hepatitis B virus is about 50 to 100 times higher than that

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of Human Immunodeficiency Virus (HIV) because Hepatitis B virus has a higher degree of infectiousness (Centers for Disease Control and Prevention (CDC), 2016). Fortunately, hepatitis B can be prevented, as there are vaccines available unlike Human Immunodeficiency Virus (HIV) that cannot be prevented with vaccines (Baruch, 2015).

Hepatitis simply means injury to the liver with inflammation of the liver cells (Davis, 2015). Not all forms of hepatitis are infectious. Consumption of alcohol, certain drugs and chemicals may have adverse health effect such as liver inflammation, as they are bad for the liver. Infections as well as autoimmune diseases, genetic problem or a metabolic disorder could also cause inflammation of the liver. Obesity can lead to liver damage also causing inflammation. These forms of hepatitis are non-infectious as they cannot spread or be transmitted from one person to another (Davis, 2015). Viral hepatitis is a group of infectious diseases known as hepatitis A, B, C, D, and E (Davis, 2016). These are the five main types of hepatitis, which are caused by viruses. A group of DNA viruses' known as Hepatitis Viruses A, B, and C are the major causative agents of hepatitis virus, responsible for most liver damage. The hepatitis virus is found in the blood and body fluid of infected individual and is transmitted from person to person (Nettleman, 2016).

Hepatitis A is caused by consuming contaminated food or water. It does not cause chronic liver disease and is rarely fatal, but can cause serious symptoms. It can be prevented through improved sanitation, food safety and vaccination (Davis, 2015). There is no specific treatment for hepatitis A. Most patients recover spontaneously and are advised to refrain from alcohol and drugs during recovery (Davis, 2015).

Hepatitis B can cause both acute and chronic infections. Hepatitis B is an acute form of hepatitis transmitted by blood, sexual contact, and body fluids and from mother to child (perinatal transmission). The majority of hepatitis B infections do not show symptoms initially, increasing the risk of people transmitting the infection without knowing (Weinbaum et al., 2008).

Hepatitis C is spread via direct contact with the blood of a person who has the disease. It is very common especially in Asia and Africa where most infections are caused by unsafe medical injections and other medical procedures (WHO, 2016). Antiviral medicines can cure approximately 90% of people with hepatitis C, thereby reducing the risk of death from liver cirrhosis and cancer (WHO, 2016). There is currently no vaccine for hepatitis C but research on this is ongoing (Davis, 2016). A person can only become infected with hepatitis D if they are already infected with hepatitis B because the hepatitis D virus is an incomplete virus that can only replicate in the presence of hepatitis B virus. Getting vaccinated against hepatitis B can prevent it. So far, no effective treatment for hepatitis D is available (WHO, 2016). People become infected with hepatitis E by drinking contaminated water (WHO, 2017). Hepatitis E usually clears in 4 to 6 weeks, so there is no specific treatment. However pregnant women infected with hepatitis E are at considerable risk of mortality from this infection. Hepatitis E vaccine has been developed and is licensed in China but it is not yet available everywhere (WHO, 2017). Hepatitis A and hepatitis E usually resolve on their own while hepatitis B, C and D can become chronic and very serious and have to be treated. No vaccines are available yet for hepatitis C and D, reducing exposure offers the best protection against infection (National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), 2012).

The main focus of this research is hepatitis B. According to Baruch (2015), 10-30 million people will become newly infected each year and approximately 2 people die each minute from hepatitis B. In addition, about 95% of people with hepatitis do not know they have it (Clerkin, 2016). More than 686,000 people die every year due to complications from hepatitis B, including cirrhosis and liver cancer (WHO, 2016). Liver cancer caused by hepatitis B is the major cause of cancer in women and ranked among the first three causes of deaths in men. Majority of people infected with hepatitis B virus rarely display any symptom although they can still transmit the virus to other people. Early identification of infected persons with the help of blood tests is very important in breaking the chain of transmission as well as starting necessary treatment with antiviral medications (Nguyen et al., 2007).

The identification and vaccination of those individuals that share household with infected persons as well as their sexual partners is also very significant. The initial phase is called the acute phase, which usually lasts less than 6 months and is usually not dangerous (Weinbaum et al., 2008). The symptoms if present are like a mild flu and may include; diarrhea, fatigue, mild fever, nausea, vomiting, loss of appetite, slight abdominal pain and weight loss (Davis, 2015, 2016). But if it persists longer than that, it becomes chronic with complications (Weinbaum et al., 2008). As it gets worse, the symptoms include; dark urine, dizziness, headaches, itchy skin, light coloured faeces which could be due to pus and jaundice (yellowing of the skin and eyes). Chronic HBV infection can lead to liver scarring (Cirrhosis) and hepatocellular (liver) cancer (Weinbaum et al., 2008).

In a country like Nigeria, HBV transmission occurs mostly during adolescence or young adulthood as a result of precarious and unprotected sexual activities and drug injections (Ipinmisho, 2016). It is also one of the transfusion-transmissible infectious agents that are considered serious threats to blood safety in transfusion recipients with higher seroprevalence relative to HIV and syphilis (Buseri et al., 2009; Akani et al., 2005). Despite availability of an effective vaccine against the infection since 1982, Nigeria is classified among the group of countries endemic, with over 20 million people infected

currently (Adoga et al., 2010). It is one of the serious menaces of public health that is neglected and not given the attention it deserves (Mbaawuaga et al., 2008). Many Nigerians are unaware of this infection and hence fail to seek the appropriate medical attention leading to its progression to chronic liver disease, cirrhosis and hepatocellular carcinoma. Although hepatitis B is classified as a 'disease of priority', there is an incessant increase in detection of new cases globally (Lok and McMahon, 2009).

The secret killer hepatitis B is yet to catch the attention of health institutions, law makers and the general public even though it is a major threat to public health. Hepatitis B education is demoted to the background such that even adults do not have any place to obtain information about this deadly disease (Boakye, 2014). No effort is made on educating most Nigerian university students as well as those who are not privileged to have access to proper education. For example, majority of non-teaching staff such as the cleaners, the gardeners, the security, and kitchen staff are not degree holders. These people have little or no knowledge about how hepatitis B is contracted or the prevalence and because of lack of knowledge it usually goes undetected for a long period of time.

Further, some people are at a higher risk of getting infected with hepatitis B virus than others (Boakye, 2014). For example, drug users, people that pierce and tattoo their bodies and engage in unprotected sex without adequate knowledge about sexual negotiation and safe sex practices (Boakye, 2014; Ipinmisho, 2016). The rate of drug use is increasing steadily over the years especially in Nigerian Universities. About 40% of Nigerian youth engage in drug/substance abuse (Ipinmisho, 2016). Young boys and girls do not care where the syringe they use in injecting the substance is coming from, they just inject it and pass it around for their friends to do the same. Also, someone who is high tends to have sex at that moment without any precautions.

HBV becomes obvious when it has progressed and sometimes at the terminal point of death. Hence the need for this study particularly in a university where drug abuse and promiscuous behaviour are rampant. Therefore, in this study, the prevalence rate of hepatitis B viral infection among students and non-teaching staff of Nile University of Nigeria was determined and knowledge about the infection was assessed.

MATERIALS AND METHODS

Study design, location and period

This is a cross-sectional study involving N=200 (150 students, 50 non-teaching staff) sample, conducted in Nile University of Nigeria. Nile University of Nigeria is a private University in the center of the Federal Capital Territory, Abuja, Nigeria. The university lies between Latitude 9.0140°N, 7.3972°E. The study was carried out over a period of three months, from the first week of February 2017 to the end of May 2017.

To encourage participation, the students and non-teaching staff were informed about the study and what it entails a week before the actual administration. The students were asked to present their student identification card to participate in the study while the non-teaching staff had to be dressed in their uniform. A self-administered knowledge assessment questionnaire was also given after obtaining a consent form for socio-demographic data collection and to assess the respondent's knowledge about the infection. The standard questionnaire consisted of several questions related to the socio-demographic characteristics of the study participants such as their gender, age, marital status, educational level, as well as risk behaviour factors like sexual status, piercings and tattoos, cigarette and alcohol consumption, intra drug usage etc.

Study population

The target populations for this study were students and non-teaching staff. Nile University has an estimated population of 1500 students and 300 non-teaching staff. The study populations were selected at random, every eligible person with equal probability of being recruited. Selection was solely based on consent and meeting of eligibility criteria. The study included students from various faculties and departments, from 100 to 500 levels. The non-teaching staff included cleaners, gardeners, kitchen staff and security. The target population included male and females of different age groups.

Eligibility criteria

Inclusion criteria: Individuals that participated in this study had to fulfill the following criteria:

i) They must be adults (aged 18 and above)
ii) They must be either students or
iii) Non-teaching staff of Nile University
iv) They must give their consent.

Exclusion criteria: Individuals that were excluded from participating in this study were:

i) Individuals younger than 18 years of age
ii) Teaching staff of Nile University
iii) Non-Nile University students
iv) People that declined or did not give their consent.

Sample size estimation

Stratified random sampling method was used to appropriately estimate the prevalence of hepatitis B virus among the population (of students and non-teaching staff N=1800) of Nile University, Abuja. A total of N=200 sample size (n=150 students, n=50 non-teaching staff) were recruited to cover for the expected attrition of up to 15% (Musa et al., 2015; Naing et al., 2006).

Data collection procedures

Willing and eligible participants were given participant information sheet (PIS), bearing objectives and study details. Interested participants were then given informed consent form (ICF) for consent taking before being given self-administered questionnaires. Participation was voluntary. Blood samples were obtained from each participant. 2 ml of venous blood sample was collected aseptically into a properly labeled laboratory-number tagged EDTA

bottle. The plasma was separated from the blood by centrifugation. The plasma specimens were then screened for HBsAg using enzyme-linked immunosorbent assay test kits within 12 h of collection (using onsite HBsAg rapid test kits sourced from EGENS One Step Rapid Diagnostic Test Reagent Technology, USA). The HBsAg assay had manufacturer-reported diagnostic specificity greater than 99.0%, sensitivity greater than 97.0% and accuracy greater than 98.0%. The test kits contained a built in control feature that served as the internal control (the C-line that appears first on the test strip). An external control consisting of a confirmed positive and a confirmed negative sample was also used to assure the proper performance of the assay. The test results were reported as positive, negative or invalid accordingly. For each invalid test, the test procedure was reviewed and the test repeated with a new strip.

Methods of HBsAg screening

Blood sample was collected from each participant using a butterfly needle into an EDTA bottle, following the standard phlebotomy procedures. The blood samples collected were kept for few hours (plasma generated within 8 h of blood draw). The specimens were then centrifuged at 1500 rpm for approximately 5 min to separate plasma from cells. The resulting plasma and the hepatitis B kits were allowed to equilibrate to room temperature. The test strips were placed on a clean non-absorbent flat surface and 30-45 μL or 2-3 drops of plasma was dropped on the sample pad of the test strip not allowing the specimen to reach above the "MAX" indicated by the arrows on the strip. Timer was set up and results were read in 15 min. If only the C line is developed, the test indicates that the level of HBsAg in the specimen is undetectable (less than 1 ng/mL); therefore, the result is clear, that is, negative/non-reactive. However, if both the C and T lines are developed, the test indicates that the specimen contains HBsAg at a level equal to or higher than 1 ng/mL and is positive/reactive. Invalid result on the other hand is obtained if no C line is developed. When this happens, the assay is repeated with a new device regardless of colour development on the T line.

Ethical consideration

All ethical considerations were in accordance with the most recent 'Fortaleza Brazil 64th WMA Assembly (October 2013)' Helsinki Ethics Declaration for medical research involving human subjects (WMA, 2013). The study obtained ethical approval from the Dean of Student Affairs, Nile University of Nigeria. The researcher also got the permission to carry out the study using the university facility (Clinic/Laboratory).

Voluntary participation was based on reading and understanding the detailed participant PIS and signing the ICF. The participants that were willing to participate in this study were given a copy of the PIS which provided important details of the study such as what the study was about, the risks involved, and confidentiality. The ICF after it was signed by the participant were kept by the research team and consent taken only at baseline.

Additional verbal clarifications were given when needed. All the participants in this study completed the questionnaire given to them and were assigned anonymous numbers that were used in data analysis. No individual including the research team had access to traceable data of the participants. Unique laboratory numbers were also assigned to each participant. These laboratory numbers were linked to patient's medical records known only to the investigator for clinical data extraction and follow up purposes. The consenting participants were also free to withdraw from the study at any time. The PIS and ICF were provided in English, and a translator was also made available for those participants who were unable to read in English for verbal explanations in Pidgin and Hausa.

The laboratory hepatitis screening and notification of results were provided free to all participants. Test results were enveloped, sealed and delivered personally to each participant by the researcher, and participants with positive test results were advised to undergo testing for markers of chronic infection in a hospital and to trace the contact for prophylactic vaccination.

Data analysis

Data were checked for completeness and validity of information once the questionnaires were back from the respondents. This was done in order to check for missing data, correct mistakes, and in order to avoid errors in the data collected. The data sheets were serially numbered. Statistical analyses were performed using IBM SPSS Version 24. Association tests for comparable continuous variables were performed using applicable tests for parametric distribution of data. Chi-square (or Fischer's exact, depending on statistical condition of the data) test were used to compare proportions. Independent t test and one way-ANOVA were used to compare mean scores between comparable variables.

RESULTS

Socio-demographic details

A total of 200 participants (150 students and 50 non-teaching staff) were screened for HBsAg. There were 50.5% (n=101) male participants and 49.5% (n=99) female participants. 21% (n=42) of the students were in 300 Level, 19% (n=38) in 200 Level and also19% (n=38) in 100 Level, 10% (n=20) were in 400 Level, and 6% (n=12) were in 500 Level of their study. 55% (n=110) of the participants were in the age group 18-21; 26% (n=52) in the age group between 22 - 25; and 19% (n=38) were older than 26 years old (Table 1). The total mean age of the participants was 22.26 (SD= ±4.2). The majority (85.0%) were single while 15.0% were married. 19% (n= 38) of them take alcohol while only 11% (n=22) of them smoke. 36.5% (n= 73) of the study participants had piercings and 3.5% (n=7) had tattoos. 41% (n=82) were in sexual relationships, however only 19% (n=38) practice safe sex. Only 9.5% (n=19) has had blood transfusions in the past. The full socio-demographic details of the study participants are shown in Table 1.

Prevalence of Hepatitis B surface antigen

Majority of the total study population, 93.5% (n=187) were negative for HBsAg. Out of the 150 students tested, 98% (n=147) were negative. Out of the 50 non-teaching staff tested, 80% (n=40) were negative. The overall prevalence of HBsAg among students and non-teaching staff of Nile University of Nigeria was estimated to be 6.5%. The prevalence of HBsAg was higher among the non-teaching staff (20.0%) than among students (2.0%). Disaggregated by gender, the prevalence was higher among males (8.9%) than among females (4.0%) (Figure 1). The prevalence varied with increasing age, with the

Table 1. Socio-demographic characteristics of study participants' (N=200).

Variable	N	%
Age		
18 – 21	110	55.0
22 – 25	52	26.0
>26	38	19.0
Gender		
Male	101	50.5
Female	99	49.5
Occupational Status		
Staff (non-teaching)	50	25.0
Student	150	75.0
Marital Status		
Single	170	85.0
Married	30	15.0
Religion		
Islam	130	65.0
Christianity	70	35.0
Residence		
On-Campus	51	25.5
Off-Campus	99	49.5
Staff	50	25.0
Alcohol Use		
Yes	38	19.0
No	162	81.0
Piercings		
Yes	73	36.5
No	127	63.5
Tattoo		
Yes	7	3.5
No	193	96.5
Smoking Status		
Yes	22	11.0
No	178	89.0
Drug use		
Yes	16	8.0
No	184	92.0
Inject Drugs		
Yes	9	4.5
No	7	3.5
Sexual Relationship		
Yes	82	41.0
No	118	59.0
No of Sexual Partners		
1-3	59	29.5
3-6	12	6.0
>6	129	64.5
Safe Sex Practice		
Yes	38	19.0
No	44	22.0
Blood Transfusion History		
Yes	19	9.5
No	181	90.5

highest prevalence found in individuals that are more than 25 years of age. 9 out of the 13 positive people were aged above 25 years.

Awareness about Hepatitis B viral infection

55.5% (n=111) of the total study participants had prior knowledge or have heard about hepatitis B viral infection while 44.5% (n=89) have never heard about the infection before. More than half of the non-teaching staff population, 64% (n=32) have no knowledge about hepatitis B infection while 36% (n=18) had knowledge about it. On the other hand, a greater number of students, 62% (n=93) are aware of the infection compared to the 38% (n=57) that are not aware of it (Figure 2).

Knowledge assessment of students

Table 2 shows the students' level of knowledge about the HBV infection. It shows that more than half of the students (59.5%) knew that HBV could be sexually transmitted. 42% of the students answered correctly that HBV could be transmitted by sharing toothbrush with an infected person. The majority (75.5%) of the students answered correctly that HBV is not transmitted by holding hands with an infected person. Only 7% of the students knew correctly that HBV is not genetic. 47% of the students knew that HBV can be transmitted during birth from mother to child. A great number (73.5%) of students knew that HBV is not an airborne virus. However, 54% of the students did not know that HBV causes liver cancer. 60% knew that HBV have signs/symptoms while only 23.5% knew that even asymptomatic carriers of HBV could transmit the infection (Table 2).

Knowledge assessment of non-teaching staff

From Table 3, most of the non-teaching staff (42%) answered incorrectly that HBV is not sexually transmitted. Only 14% knew that HBV could be transmitted by sharing toothbrush. Half of the non-teaching staff (50%) knew that HBV is not transmitted by holding hands with an infected person. However, more than half (58%) of them answered incorrectly that HBV is inherited. 26% of the non-teaching staff knew that HBV can be transmitted from mother to child. More than half (52%) of them knew that HBV is not airborne. Only 14% of them knew that HBV causes liver cancer. 50% of the non-teaching staff answered correctly that HBV has signs/symptoms. Majority (62%) of them were unaware that an asymptomatic carrier of HBV can transmit it (Table 3).

Source of information on hepatitis virus infection

The major source of information about Hepatitis B virus

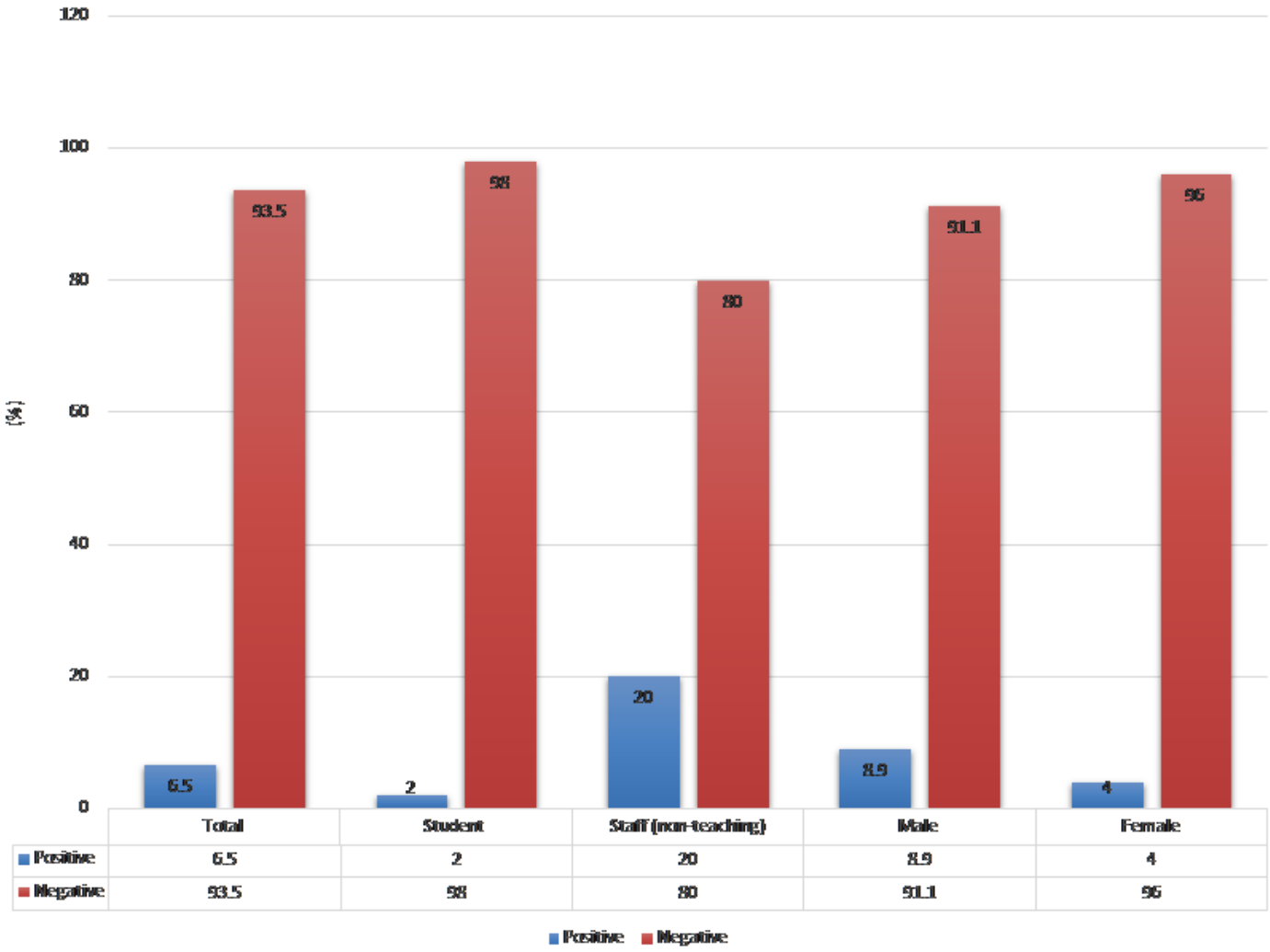

Figure 1. Prevalence of HBsAg in the study population (N=200).

was the media. 36.1% of the total study population (29% of the students and 13% of the non-teaching staff) got their information about the infection through the media. 27% of the total study population (29% of the students and 3% of the non-teaching staff) indicated family and friends as their source of information about the infection while 17.2% of the students got their knowledge of the infection from school (Figure 3). Hospital was the source of information on hepatitis B virus for 17.2% of the student population. 7.6% of the students indicated church as their source of information about hepatitis B. No non-teaching staff acquired information about the infection from school, hospital and church. Meanwhile 2% of the staff population got their information about HBV through other sources (Figure 3).

DISCUSSION

The overall prevalence rate of Hepatitis B viral infection among students and non-teaching staff of Nile University of Nigeria was estimated to be 6.5%. The prevalence of HBsAg was higher among non-teaching staff (20.0%) than among students (2.0%). Disaggregated by gender, the prevalence was higher among males (8.9%) than females (4.0%).

The results are in contrast with the findings of Mboto and Edet (2012) but consistent with the findings of a prevalence study carried out in University of Maiduguri (Isa et al., 2015). The results are also consistent with the prevalence study carried out in University of Jos, Nigeria (Ekuma et al., 2014) where males had a significantly higher HBsAg prevalence compared to their female counterparts. The knowledge level among students was significantly higher than that among the non-teaching staff probably due to the source(s) of information they had access to.

Also, the response from the questionnaire indicated that non-teaching staff, especially the males had more sexual partners compared to the students who were not as sexually active and practiced safe sex. The

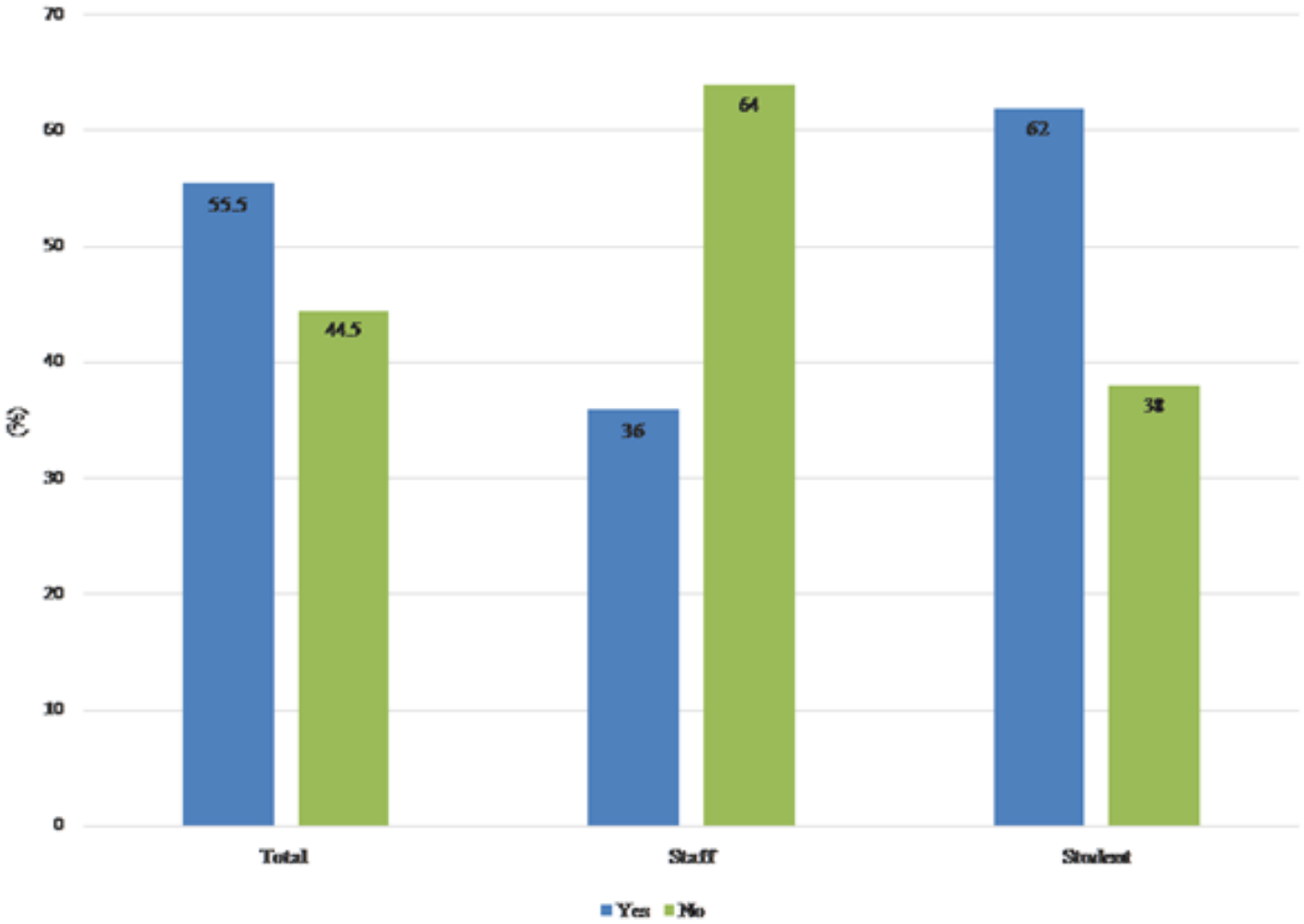

Figure 2. Awareness about Hepatitis B viral infection (N=200).

Table 2. Knowledge assessment of students (N=150).

Knowledge	Yes {N (%)}	No {N (%)}	Don't Know {N (%)}	Total {N (%)}
Do people get HBV through sexual intercourse?	89(59.5)	35(23)	26(17.5)	150(100)
Do people get HBV by sharing toothbrush?	63(42)	40(27)	47(31)	150(100)
Do people get HBV by holding hands?	19(12.5)	113(75.5)	18(12)	150(100)
Do people inherit HBV?	69(46)	11(7)	70(47)	150(100)
Do people get HBV during birth?	70(47)	56(37)	24(16)	150(100)
Do people get HBV through air?	10(6.5)	110(73.5)	30(20)	150(100)
Does HBV cause liver cancer?	42(28)	27(18)	81(54)	150(100)
Does HBV have signs and symptoms?	90(60)	25(17)	35(23)	150(100)
Can an asymptomatic person transmit HBV?	35(23.5)	29(19)	86(57.5)	150(100)

differences in exposure to risk factor could be the reason for the differences in prevalence. The higher prevalence among the non-teaching staff is probably due to lack of knowledge about safe sex practices as a result of the level of their education despite being older than the students. Most of them were gardeners, cooks, cleaners, technicians etc. hence it is not surprising that they are unaware of the existence of such an infection. This study

Table 3. Knowledge assessment of non-teaching staff (N=50).

Knowledge	Yes {N (%)}	No {N (%)}	Don't Know {N (%)}	Total {N (%)}
Do people get HBV through sexual intercourse?	12(24)	21(42)	17(34)	50(100)
Do people get HBV by sharing toothbrush?	7(14)	40(80)	3(6)	50(100)
Do people get HBV by holding hands?	17(34)	25(50)	8(16)	50(100)
Do people inherit HBV?	29(58)	11(22)	10(20)	50(100)
Do people get HBV during birth?	13(26)	14(28)	23(46)	50(100)
Do people get HBV through air?	10(20)	26(52)	14(28)	50(100)
Does HBV cause liver cancer?	14(28)	27(54)	9(18)	50(100)
Does HBV have signs and symptoms?	25(50)	6(12)	19(38)	50(100)
Can an asymptomatic person transmit HBV?	15(30)	4(8)	31(62)	50(100)

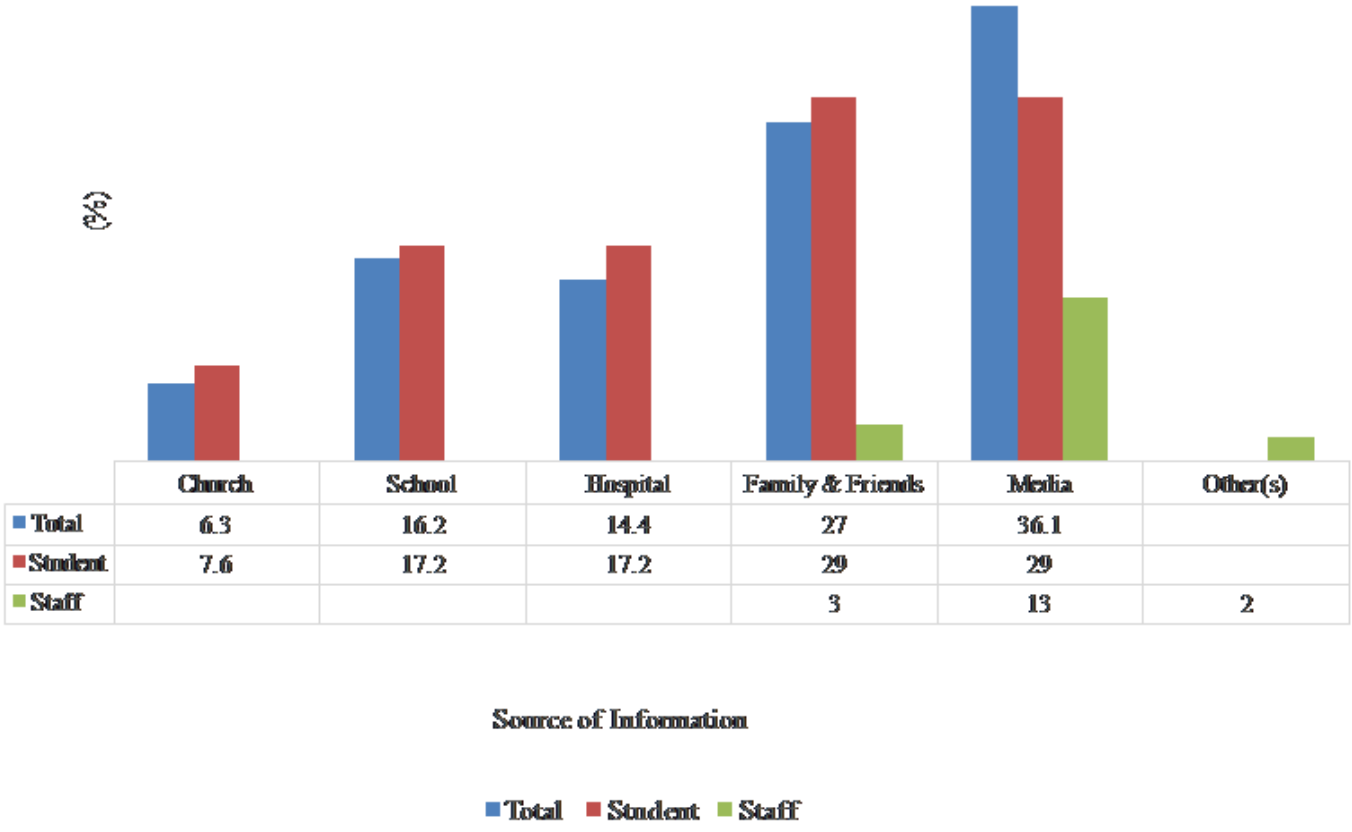

Figure 3. Source of information on Hepatitis B viral infection (N=200).

also showed that females had more knowledge about the infection compared to their male counterparts. This could be another reason for the higher prevalence in males.

Attributing factors for HBV infection

The prevalence of Hepatitis B viral infection among non-teaching staff of Nile University is significantly higher than among students (P<0.001) (Table 4). Those who practice safe sex had lower prevalence of HBV infections than those who did not practice safe sex, and the difference was statistically significant (*P*<0.001). Likewise, those who are not sexually active recorded a significantly lower prevalence (all sexually inactive individuals in this study were negative) compared to those who are sexually active (P<0.001).

Interestingly, those who have donated blood have a lower prevalence of HBV compared to those who have not donated blood previously (P< 0.024).

Table 4. Factors associated with HBV infection.

Variable	N	HBV +ve {N (%)}	HBV –ve {N (%)}	X^2 Statistics (df)	*P* value[a]
Gender					
Male	101	9 (8.9%)	92 (91.1)	1.95 (1)	0.162
Female	99	4 (4.0)	95 (96.0)		
Educational Status					
Student	150	3 (2.0)	147 (98.0)		<0.001[b]
Non-teaching staff	50	10 (20.0)	40 (80.0)		
Marital Status					
Single	170	12 (7.1)	158 (92.9)		0.696[b]
Married	30	1 (3.3)	29 (96.7)		
Age					
18-21	110	2 (1.8)	108 (98.2)		
22-25	52	2 (3.8)	50 (96.2)		
>25	38	9 (23.7)	29 (76.3)		
Safe Sex					
Yes	38	0 (0.0)	38 (100.0)		<0.001[b]
No	44	13 (29.5)	31 (70.5)		
Sexually Active?					
Yes	81	13 (16.0)	68 (84.0)	20.43(1)	<0.001
No	119	0 (0.0)	119 (100.0)		
Transfusion (donated)					
Yes	19	4 (21.1)	15 (78.9)		0.024[b]
No	181	9 (5.0)	172 (95.0)		
Sexual Partners (n)					
1-3	59	0 (0.0)	59 (100.0)		0.004[b]
3-6	12	3 (25.0)	9 (75.0)		
>6	129	10 (7.8)	119 (92.2)		

[a]Chi-square test of independence; [b]Fisher's exact test.

The more sexual partners, the higher the prevalence of HBV (*P*<0.004). However, the prevalence of HBV infection between male and female (P<0.162) and being married or single (0.696) were not statistically different (Table 4).

Conclusion

This study thus showed a low prevalence rate of Hepatitis B viral infection among the students and non-teaching staff of Nile University of Nigeria. The prevalence was significantly higher among the non-teaching staff than among students and higher among males than females. The prevalence was also significantly higher among those with multiple sexual partners, who do not practice safe sex. The difference in prevalence is probably because the non-teaching staff engage in more promiscuous activities and most of them are unaware or completely ignorant on safe sex practices coupled with the fact that they have little or no knowledge of hepatitis B and its health challenges. Hence the need for creation of awareness in the university is of great importance because if adequate precautions are not taken, the spread of hepatitis B virus could continue unabated.

It is said that "disease control by preventive strategy is more effective than a curative one". The best time to tackle an issue is at its earliest stage. It is therefore at this point in time when the prevalence of the virus in the university is low that action should be taken. Hepatitis B is the deadliest of all viral hepatitis; this fatal health issue should not be neglected as it is less obvious and more infectious than the highly stigmatized HIV/AIDS. It is difficult to eradicate or prevent the spread of a disease without continuous sustainable awareness creation and enlightenment. An academic course addressing it and other serious infectious diseases should be made mandatory to be taken by all university students. Also, periodic seminars and trainings should be organised for non-teaching staff. Enlightenment programs should be made available for students and both teaching and non-teaching staff of the university. In addition, vaccination/immunization should be made available for all students and staff. This fatal health issue should be

neglected no more; it is obvious that it is more infectious than the highly stigmatized HIV/AIDS. Finally, universities should come up with follow-up programs that will help those already infected to manage and treat the infection.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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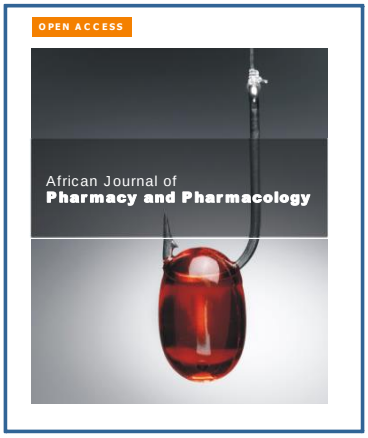

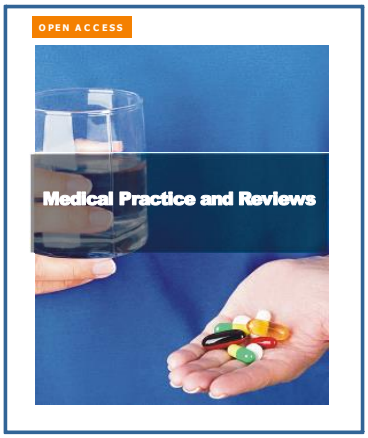

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