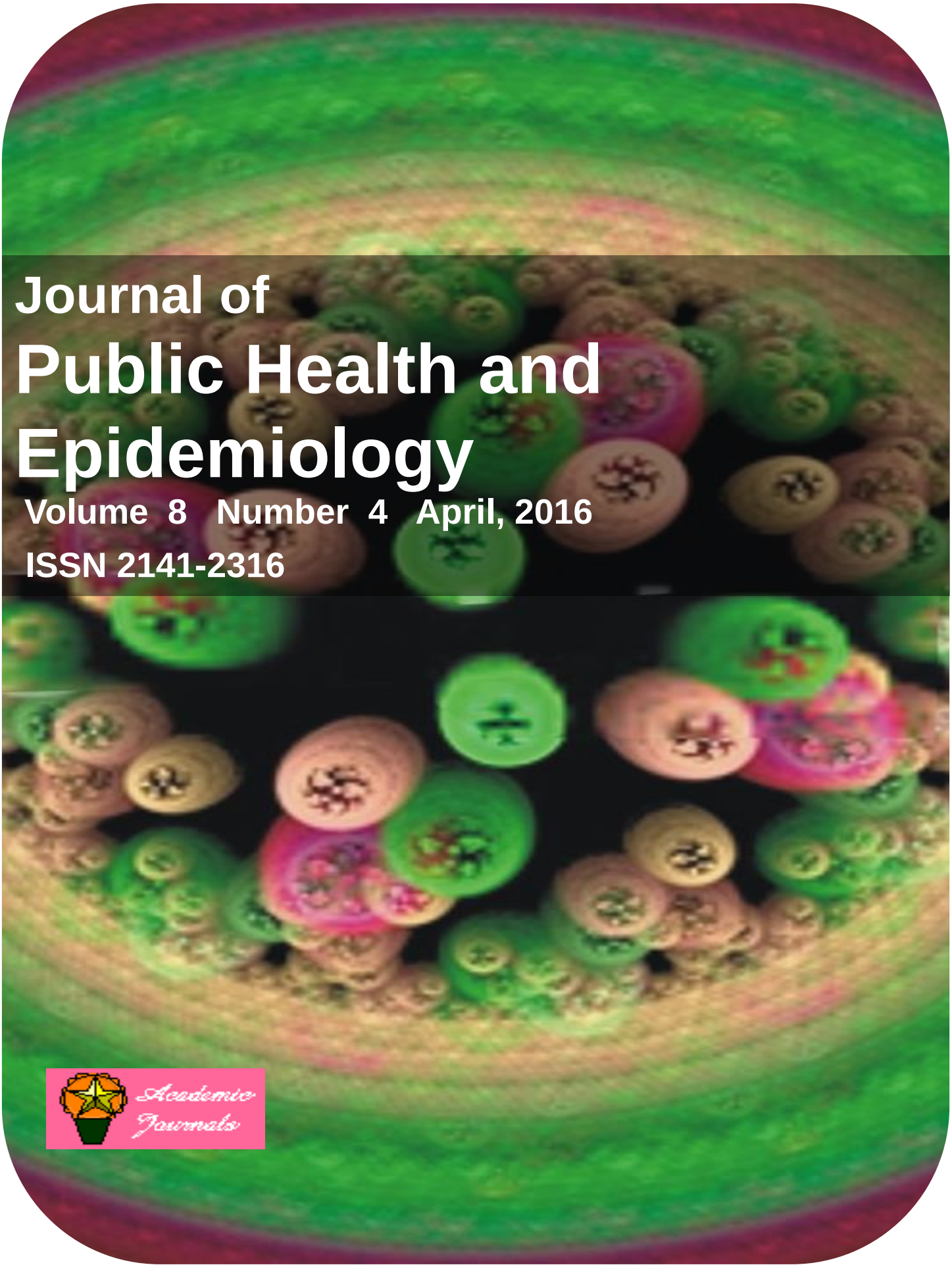

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Pitout JDD, Church DL, Gregson DB, Chow BL, McCracken M, Mulvey M, Laupland KB (2007). Molecular epidemiology of CTXM-producing Escherichia coli in the Calgary Health Region: emergence of CTX-M-15-producing isolates. Antimicrob. Agents Chemother. 51: 1281-1286.

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Full Length Research Paper

Public attitude and awareness towards their teeth color and dental bleaching in Saudi Arabia: A cross-sectional survey

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Advances in restorative dentistry have made many tooth whitening techniques economical and cost effective both in developed and developing countries. The purpose of this study was to evaluate the attitude and awareness of tooth bleaching among a sample of adults attending shopping malls in Riyadh city, Saudi Arabia. A cross sectional survey was performed in four major malls located in different regions of Riyadh city in Saudi Arabia. A total of 520 adult visitors were randomly selected to participate in this study. In addition, 82 dentists were requested to participate in the study. Knowledge and attitude toward teeth color and dental bleaching were assessed by using self-administered and pretested questionnaire. Descriptive statistics were carried out to express participant's socio-demographic information. Multivariate logistic regression analysis (using enter method) and chi-square tests were used to identify independent predictors of positive attitudes toward dental bleaching. A total of 55.8% of male and 44.2% female responded to the questionnaire. Among all the respondents 67.4% were not satisfied with their tooth color and 77.7% were willing to undergo tooth whitening procedure. Females showed more positive attitude towards tooth bleaching (odd ratio (OR) 1.9, 95% confidence interval (CI): 1.181-3.166). Participants rated with having excellent, good and fair knowledge exhibited positive attitude toward tooth bleaching compared to participants with poor knowledge (OR: 8.4, 3.4, and 2.0; 95% CIs: 3.31-21.18, 1.81-6.36, and 1.08-3.76). The results depict that majority of the study participants were not satisfied with their tooth color and were willing to undergo tooth whitening procedures. Additionally, gender differences were observed with regards to the attitude towards bleaching. Moreover, participants who had the knowledge of tooth color showed more positive attitude towards tooth bleaching.

Key words: Attitude, awareness, perception, tooth bleaching, teeth color.

INTRODUCTION

Tooth discoloration is classified as intrinsic and extrinsic discoloration; former develops at the time of tooth

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formation and later develops after the tooth formation. Drugs like tetracycline, high levels of fluoride and exposure to certain metals during tooth formation causes intrinsic staining (Hannig and Joiner, 2006; Alshara et al., 2014). These stains are non-responsive to abrasives and home use bleaching agents. Whereas certain foods such as tea, coffee and tar products from tobacco and certain occupational exposure to metals cause extrinsic stains and many times these stains are responsive to home use of bleaching agent (Hannig and Joiner, 2006; Alshara et al., 2014).

Recent advancement in restorative and adhesive technology has increased the opportunities for both patients and clinicians to provide best non-invasive treatment for better esthetics through conservative and economical approaches (Terry and Geller, 2012). Tooth bleaching is one of the blessings of development in restorative and esthetic dentistry (Dahl and Pallesen, 2003). Recent advancement under the professional supervisions and proper examination and diagnosis has increased its acceptability worldwide. But in the past, its side effects and less conservative techniques had restricted its use and acceptability among patients (ADA Council on Scientific Affairs, 2009).

Globally, many studies have been conducted to evaluate patient's level of satisfaction in terms of dental esthetics (Azodo and Ogbomo, 2014; Mehl et al., 2014, 2015). Caucasian study reported certain predictors of tooth bleaching which included hiding teeth during smiling, bleached teeth, female gender, lower levels of satisfaction with dental appearance and the absence of the previous orthodontic therapy (OR: 5.8, 2.4, 1.8, 0.5, and 0.4, respectively) (Grzić et al., 2012). A study conducted among 235 Malaysian adult population showed that the 52.8% were unhappy with their dental appearance, 56.2% were not satisfied with their tooth color, and 48.1% desired tooth bleaching (Tin-Oo et al., 2011). Patient's attitudes and feelings towards aesthetics dentistry have been improved due to the simplicity of the procedure followed by speedy result of tooth bleaching. Over the past five years, a 300% increase in the demand for bleaching among American adults aged 20 to 50 years has been observed (Morley, 1999). Similarly, study conducted at the Medical University of Lodz, Poland among 313 patients seeking tooth bleaching treatment showed that the 61.0% were not satisfied with the appearance of their teeth and 89.1% had attempted to improve the appearance of their teeth by using whitening dentifrices. However, half of them were concerned about the safety of the bleaching procedures (Wisniewski et al., 2004).

In New Zealand, a study conducted among 600 general dental practitioners (GDPs) reported an increased demand for tooth whitening (77.8%) and veneers (54.8%). Additionally, 56.8% GDPs believed that patients had higher aesthetic expectations and female had increased demand for tooth whitening than male (Theobald et al., 2006). Similar study conducted among 693 young adults from Hong Kong reported that the 80.2% perceived that their teeth were not white enough. Age was found to be a significant predictor for the increased demand of tooth bleaching (Chan et al., 2013). On contrary, Saudi Arabian study conducted in 2000 reported that 25.6% dental patients used saline and 10% used lemon as bleaching agent at home (Almas et al., 1999). In the recent year with the advancement in restorative dentistry, dental esthetics has become an important aspect among individuals in developing countries. Study conducted in 2013 in Saudi Arabia reported that of the 220 patients evaluated on visual analogue scale scores for satisfaction was 6.8 ± 2.3 with 65.9% were dissatisfied with tooth discoloration (Al-Zarea, 2013).

Until now, very little information about esthetic awareness of orthodontics, prosthesis and restorative dentistry is available from Saudi Arabia. Moreover, past studies mainly focus on dental patients rather than general public, thus limiting their generalizability of results to the wider population. With advancement in restorative dentistry, many techniques have become economical and cost effective for both developed and developing countries and one of such technique is tooth bleaching. Nowadays, tooth bleaching becomes cost effective and conservative with added advantages of long term functionality and effectiveness. Hence, the aim of this study was to evaluate the attitude and awareness of tooth bleaching among the adult population aged 18 to 45 years from Riyadh city, Saudi Arabia.

METHODOLOGY

Study design and sampling technique

This is a population-based cross sectional study. A cluster-sampling technique was employed and 4 shopping malls were selected randomly from the five regions of the capital city, Riyadh: northern, eastern, western, southern, and central regions. The four malls were visited in the period between June 20 to July 19, 2015 and individuals visiting the mall were asked to complete the self-administered questionnaire. To know about the professional views regarding tooth bleaching, a convenient sample of dentists was also recruited from King Abdul Aziz Medical City-Riyadh (KAMCR) to complete the questionnaire.

Data collection tool

The self-administered questionnaire composed of two main sections. Firstly, socio-demographic data which included age, gender, occupation, educational level, area of residence, and smoking history. Secondly, attitude towards teeth bleaching was assessed by three questions addressing the following: willingness to undergo bleaching in the future, approving the use of whitening material on the teeth surfaces to get a lighter shade of teeth color and lastly willingness to recommend teeth bleaching for family or friends. An initial draft of the questionnaire was prepared by author and validated in two steps. Firstly, study instrument was sent to experts in the field of esthetic dentistry and their opinion was taken with regards to the content of the questionnaire. Secondly, pilot study was undertaken in a sample of 20 adults by using the

questionnaire and changes were made to ensure comprehensibility and reliability. A satisfactory Cronbach's alpha was obtained for conducting the study. Participants involved in the pilot study were excluded from the final study. Responses such as yes, no, agree, disagree or uncertain were used in the questionnaire.

Ethical considerations

The participation in the study was voluntary. Confidentiality of the data was assured throughout the study. Study was approved by the King Abdul Aziz Medical City-Riyadh, National Guard Ministry of Health Affairs Saudi Arabia (IRB approval no. RSS-004).

Statistical analysis

Descriptive statistics of Bar charts and frequency tables were generated to display the characteristics of the population and their attitude towards teeth bleaching. Multivariate logistic regression analysis (using enter method) and chi-square tests were used to identify independent predictors of positive attitudes. Potential predictors of tooth bleaching, include nationality, region of residency, smoking status, frequency of visiting the dentist, satisfaction with teeth color, and perception about tooth bleaching. SPSS Statistics for Windows, Version 21 Armonk, NY: IBM Corporation was used for statistical analysis and p≤ 0.05 was used to define statistical significant results.

RESULTS

Out of 647 subjects approached, 520 completed the questionnaire (80.37% response rate) along with a sample of 82 dentist were also included in the survey. Thus, a total of 602 participants were included in the study.

Total of 602 filled questionnaires were obtained which included-males (55.8%) and females (44.2%) with majority of the study participants (90.4%) were Saudi nationals. Most of the study participants (41%) had their residence in Northern part followed by other regions of the Riyadh city. Age distribution of the study participants ranged from 18 to 45 years and above. Of the total participants, 37.5% were in the age range of 18 to 24 years, followed by others. Smoking history revealed that most (86.9%) of the participants were non-smokers and 83.1% had no habit of water-pipe tobacco use. Among the participants, 86.4% were non-dentists. Table 1 shows the socio-demographic data of the study participants.

The present study revealed that 67.4% were not satisfied with their tooth color and 72.8% had visited dentist 5 or more times. Almost 40% of the participants had a good knowledge of teeth whitening. In addition, 76.7% participants had positive attitude towards tooth bleaching. Chi square test showed gender, age, marital status, satisfaction with tooth color and knowledge about teeth whitening significant differences in attitude towards tooth bleaching. Female had significantly higher positive attitude towards bleaching than male (83.8% vs. 71.1%, P=0.001). Study participants aged 18 to 24 years showed significantly higher positive attitude followed by respondent of age 25 to 34 years, >/=45 and 35 to 44 years (82.7% vs. 75.9, 72.7, and 67.3%, p=0.018), respectively. Moreover, unmarried study participants had more positive attitude than married (82.7% vs. 70.6%, p= 0.001). Similarly, participants satisfied with the color of their teeth and those who had excellent knowledge about the bleaching showed significantly positive attitude towards teeth bleaching (p=0.001) (Table 2).

Around 77.7% of the study participants reported their willingness to undergo teeth bleaching in near future and 65.8% expressed their agreement for the placement of the whitening agent on the tooth surface involving the smile line to get lighter tooth color shade. More than three fourth 76.6% of the study participants reported that they will recommend teeth bleaching to their family and friends (Figure 1).

Logistic regression analysis was performed to identify the predictors of positive attitude towards tooth bleaching. Females and those satisfied with color of teeth showed higher odds ratio compared to their counterparts (OR=1.9; 95% CI: 1.181-3.166) and (OR=0.3; 95% CI: 0.208-0.505). Moreover, study participants who rated their knowledge excellent, good and fair had higher odds as compared to those who had poor knowledge (ORs= 8.4, 3.4, and 2.0; 95% CIs: 3.31-21.18, 1.81-6.36, and 1.08-3.76), respectively (Table 3).

DISCUSSION

Introduction of the tooth whitening technique has changed the individual's attitudes and perceptions towards dentistry. This present cross-sectional study was conducted among 602 participants to investigate the knowledge and attitude towards tooth bleaching in Riyadh city, Saudi Arabia. Study findings suggested that 67.4% were not satisfied with their tooth color. This study finding was higher than that reported in Malaysia 56.2% and Poland 61% (Wisniewski et al., 2004; Tin-Oo et al., 2011).

Further analysis showed that around three quarter of the participants had a positive attitude towards tooth bleaching. Comparative data suggested that females, young age group (18 to 24 years), unmarried individual, those who were not satisfied with their tooth color and those with excellent knowledge of tooth color had positive attitude towards tooth bleaching. This study finding is in line with other reported studies from Malaysia and Newzealand (Theobald et al., 2006; Tin-Oo et al., 2011; Grzić et al., 2012).

Logistic regression analysis showed that the females, those not satisfied with tooth color, and those having excellent knowledge of tooth colour significantly had higher odds ratio as towards tooth bleaching compared to their counterparts. This could be explained on the basis that females are more interested about their appearance than male and seems to be more concerned about dental appearance and are more critical in their judgment

Table 1. Socio-demographic data of the study participants (n=602).

Characteristic	Levels	n	%
Nationality	Saudi	544	90.4
	Non-Saudi	58	9.6
Residency	Central Riyadh	101	16.8
	Northern Riyadh	247	41.0
	Eastern Riyadh	134	22.3
	Western Riyadh	65	10.8
	Southern Riyadh	55	9.1
Gender	Male	336	55.8
	Female	266	44.2
Age in years	18 – 24	226	37.5
	25 – 34	212	35.2
	35 – 44	98	16.3
	≥ 45	66	11.0
Marital status	Unmarried	306	50.8
	Married	296	49.2
Education	High school or less	67	11.1
	University	535	88.9
Cigarette smoke	No	523	86.9
	Yes	79	13.1
Waterpipe tobacco use	No	500	83.1
	Yes	102	16.9
Satisfied with the color shade of your teeth?	No	406	67.4
	Yes	196	32.6
Occupation	Dentists	82	13.6
	Non-Dentists	520	86.4
How many times did you visit the dentist?	Never	29	4.8
	1-5 times	135	22.4
	5 or more	438	72.8
Respondents rate their knowledge about teeth whitening	Excellent	110	18.3
	Good	242	40.2
	Fair	173	28.7
	Poor	77	12.8

towards dental esthetics (Vallittu et al., 1996; Hassel et al., 2008). In our study, female gender was also found as an important predictor factor for tooth bleaching. Unlike the studies conducted in Sweden and China, this study highlighted that gender is associated with dental esthetics (Xiao et al., 2007; Carlsson et al., 2008).

Additionally, this study also reported that the female gender as an important predictive factor for tooth bleaching which is contrary to the findings reported Chinese and Swedish studies (Xiao et al., 2007; Akarslan et al., 2009). In this study, education level did not influence the positive attitude towards tooth bleaching like

Table 2. The attitude towards tooth bleaching and its relation to sample characteristics (n=602).

Characteristics	Levels	Negative [140 (23.3%)]		Positive [462 (76.7%)]		P value
		n	%	n	%	
Nationality	Saudi	122	22.4	422	77.6	0.140
	Non-Saudi	18	31.0	40	69.0	
Residency	Central Riyadh	23	22.8	78	77.2	0.861
	Northern Riyadh	63	25.5	184	74.5	
	Eastern Riyadh	28	20.9	106	79.1	
	Western Riyadh	14	21.5	51	78.5	
	Southern Riyadh	12	21.8	43	78.2	
Gender	Male	97	28.9	239	71.1	0.001*
	Female	43	16.2	223	83.8	
Age in years	18 – 24	39	17.3	187	82.7	0.018*
	25 – 34	51	24.1	161	75.9	
	35 – 44	32	32.7	66	67.3	
	≥ 45	18	27.3	48	72.7	
Marital status	Unmarried	53	17.3	253	82.7	0.001*
	Married	87	29.4	209	70.6	
Education	High school or less	17	25.4	50	74.6	0.663
	University	123	23.0	412	77.0	
Cigarette smoke	No	124	23.7	399	76.3	0.498
	Yes	16	20.3	63	79.7	
Waterpipe tobacco use	No	120	24.0	380	76.0	0.339
	Yes	20	19.6	82	80.4	
Satisfied with the color shade of your teeth?	No	75	18.5	331	81.5	0.001*
	Yes	65	33.2	131	66.8	

Table 2. Cont"d

Occupation	Dentists	14	17.1	68	82.9	0.154
	Non-Dentists	126	24.2	394	75.8	
How many times did you visit the dentist?	Never	11	37.9	18	62.1	0.116
	1-5 times	27	20.0	108	80.0	
	5 or more	102	23.3	336	76.7	
Respondents rate their knowledge about teeth whitening	Excellent	10	9.1	100	90.9	0.001*
	Good	48	19.8	194	80.2	
	Fair	48	27.7	125	72.3	
	Poor	34	44.2	43	55.8	

*Chi-square test is significant at α=0.05.

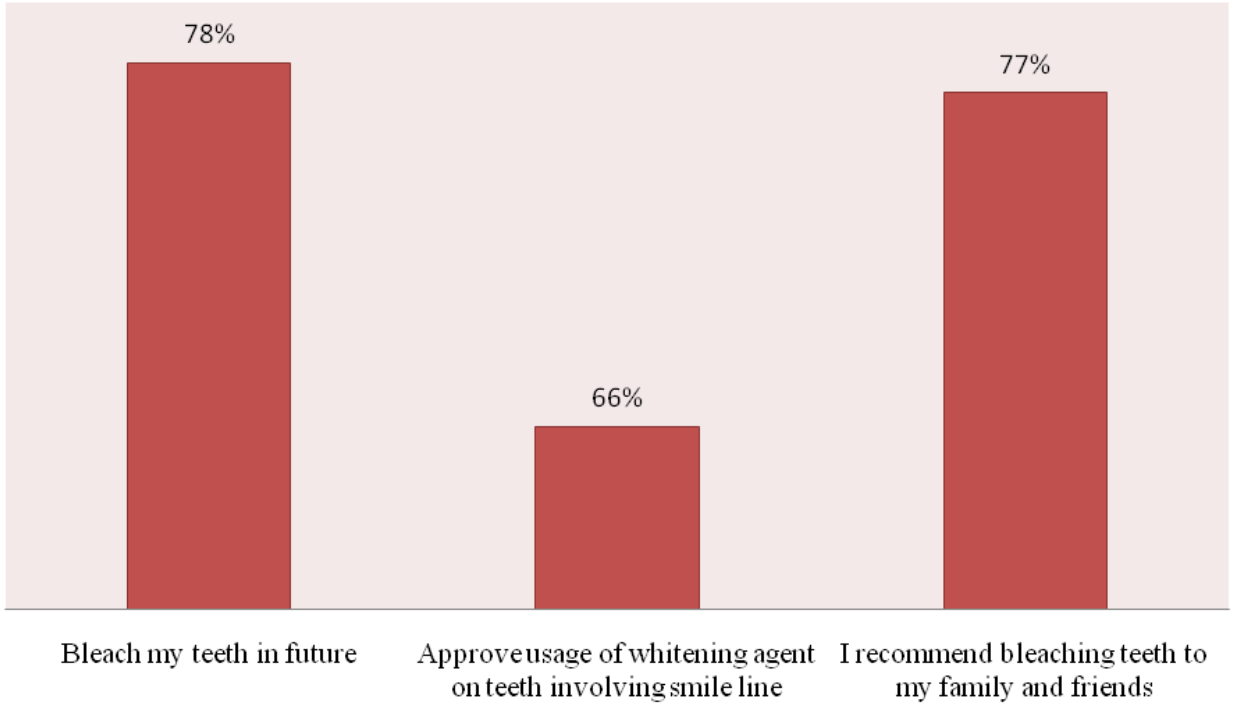

Figure 1. The Attitude towards tooth bleaching (N= 602).

Table 3. Logistic regression: Factors associated with positive attitude toward tooth bleaching (n= 602).

Characteristic	Reference	B	SE	P	OR	95% CI for OR	
						Lower	Upper
Saudi	Non-Saudi	0.22	0.34	0.529	1.2	0.633	2.438
Central Riyadh	Southern Riyadh	-0.38	0.44	0.391	0.7	0.285	1.632
Northern Riyadh	Southern Riyadh	-0.39	0.40	0.331	0.7	0.312	1.481
Eastern Riyadh	Southern Riyadh	-0.24	0.43	0.585	0.8	0.338	1.844
Western Riyadh	Southern Riyadh	-0.15	0.49	0.767	0.9	0.331	2.262
Female	Male	0.66	0.25	0.009*	1.9	1.181	3.166
18 – 24 Years	≥ 45 Years	-0.03	0.45	0.949	1.0	0.403	2.343
25 – 34 Years	≥ 45 Years	-0.25	0.36	0.493	0.8	0.385	1.583
35 – 44 Years	≥ 45 Years	-0.41	0.39	0.287	0.7	0.310	1.415
Unmarried	Married	0.35	0.30	0.235	1.4	0.795	2.548
University	High school or less	0.45	0.34	0.188	1.6	0.802	3.078
Cigarette smoke	None	0.36	0.34	0.287	1.4	0.740	2.776
Waterpipe tobacco use	None	0.20	0.30	0.518	1.2	0.672	2.200
Satisfied with the color shade of your teeth	No	-1.13	0.23	0.001*	0.3	0.208	0.505
Dentists	Non-dentists	-0.41	0.38	0.288	0.7	0.315	1.408
How many times did you visit the dentist							
1-5 times	Never	0.91	0.50	0.069	2.5	0.932	6.574
5 or more	Never	0.46	0.46	0.317	1.6	0.641	3.944
How would you rate your knowledge about teeth whitening							
Excellent	Poor	2.13	0.47	0.001*	8.4	3.319	21.188
Good	Poor	1.22	0.32	0.001*	3.4	1.818	6.363
Fair	Poor	0.70	0.32	0.026*	2.0	1.087	3.763
Constant	-	-0.48	0.74	0.516	0.6	-	-

*Wald Chi-square test is significant at α=0.05.

the study conducted in Malaysia (Tin-Oo et al., 2011). However, in this study, the people who rated their knowledge as excellent about tooth whitening had positive attitude towards tooth bleaching.

There are few limitations in our study. Firstly, the assessment was subjective and did not correlate the findings with their dental problem. However, obtaining dental record was not possible due to the selection of the study participants from the general population visiting the malls instead of patients visiting dental clinics. The present study surveyed the sample from general population rather the patients visiting dental clinic who are generally sensitive about their dental appearance. Secondly, study included wide age range of participants from either gender with sufficient numbers so that the results can be generalized. Thirdly, participants were recruited from the different area of Riyadh so that variability of findings can be maintained.

Conclusion

Within the limitations of the study, it can be concluded that most of the study participants were not satisfied with their tooth color, and were willing to undergo tooth whitening procedures. Additionally, gender differences existed with regards to the attitude towards bleaching. Participants who had the knowledge of tooth color showed more positive attitude towards tooth bleaching.

Conflict of interest

The author has not declared any conflict of interest.

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Knowledge, risk perception and hepatitis B vaccination status of healthcare workers in Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria

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Hepatitis B virus (HBV) infection threatens the health of populations across the globe. It is an important occupational risk for health care workers (HCWs); they are known to be at high risk of the infection following needle stick injuries and accidental exposure to infected blood and other body fluids. This study was conducted to assess the knowledge, risk perception and hepatitis B vaccination status of HCWs in Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto, Nigeria. A descriptive cross-sectional study among 124 HCWs selected by multistage sampling technique was conducted in the months of February to April 2013. Informed consent was taken and information was collected by a pre-designed questionnaire, data analysis was done using computer software, SPSS version 20. Majority of respondents (86.3%) demonstrated good knowledge of HBV infection. Most of the respondents (92.7%) perceived themselves to be more at risk of HBV infection as compared to the general population by virtue of their profession. Only 50 (40.3%) of the 124 respondents have been vaccinated against HBV infection. In addition, only 28 (56.0%) of the 50 respondents that have been vaccinated against HBV infection had the recommended three doses of the vaccine. This study demonstrated poor uptake of hepatitis B vaccination among HCWs in UDUTH, Sokoto, Nigeria, despite good knowledge and high risk perception. Periodic education of staff on prevention of transmission of blood and other body fluids borne pathogens in the hospital setting, and promotion of accessibility to vaccines against relevant vaccine preventable diseases in the healthcare facilities are hereby suggested.

Key words: Knowledge, risk perception, hepatitis B, vaccination status, healthcare workers.

INTRODUCTION

Hepatitis B virus (HBV) infection threatens the health of populations across the globe. An estimated 240 million

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people are chronically infected and more than 780,000 people die every year due to complications of hepatitis B including cirrhosis and liver cancer (WHO, 2015). Approximately one third of all cases of cirrhosis and half of all cases of hepatocellular carcinoma can be attributed to chronic HBV infection, and the disease is estimated to be responsible for 50,000-700,000 deaths each year (Shepard et al., 2006; WHO, 2004).

Liver diseases are common in Africa and account for high morbidity and mortality. Reports from hospital based studies show that about 12% of medical admissions and more than 20% of hospital mortality in many parts of Africa were due to acute viral hepatitis, chronic hepatitis, cirrhosis and hepatocellular carcinoma. Chronic carrier rates among the general population in Nigeria ranged from about 12 to 48.7% in different states and cities (Olokoba et al., 2010).

Primary liver cell carcinoma (PLCC) arising from a chronic liver disease is the commonest cancer of males in Nigeria, the frequency of which can only be compared to that of prostatic cancer. Reports from the University College Hospital, Ibadan, Nigeria, showed that PLCC accounted for 491 out of 100,000 hospital admissions; it was the commonest malignancy among patients in the medical wards of the hospital and the commonest cause of death from cancer in the middle-aged as well as elderly Nigerians (Braunwald et al., 2001).

Hepatitis B virus infection is an important occupational risk for health care workers (WHO, 2015). They are known to be at high risk of the infection following needle stick injuries and accidental exposure to infected blood and other body fluids (Kesieme et al., 2011; Hussein et al., 2010). Health care workers in Nigeria are particularly at increased risk of contracting HBV infection in their work place, because the country is holoendemic for the disease (Olokoba et al., 2010). Hepatitis B virus is by far the most dreaded and more infectious than the other blood-borne pathogens. Estimates of the risk of a single needle stick injury indicated 30% risk of hepatitis B virus infection, 3% risk of hepatitis C virus infection and 0.3% risk of HIV infection (Ibekwe and Ibeziako, 2006; Lavanchy, 2005; Smith et al., 2001).

The risk of transmission of HBV from patients to HCWs is higher than the risk of transmission of the virus from HCWs to patients. It has been reported that the risk of transmission varies greatly amongst different disciplines, with surgery, gynaecology and orthopaedic services having the greatest risk (Moghimi et al., 2009). Needle-stick injuries, especially those involving hollow needles have been reported as the most common route of transmission (De Villiers et al., 2007; Alam, 2002; Smith et al., 2001).

The risks and preventive measures against occupational exposure of HCWs to blood borne pathogens are well documented. Although, universal precautions were established many years ago to address this problem, their application is difficult in developing countries, owing to organizational problems and lack of necessary materials such as gloves and proper needle-disposal facilities (Le Pont et al., 2003).

Reports from studies conducted in health facilities across Nigeria show high prevalence of injury from sharps and accidental exposure to potentially infected blood and body fluids, while use of personal protective equipment was found to be low due to unavailability, inadequate or irregular supply of materials and equipment needed for protective and hygienic practices in most of the health facilities (Adesunkanmi et al., 2003; Ansa et al., 2002).

Although, evidence has shown that HBV infection is preventable by vaccination (Pungpapong et al., 2007), and several vaccines have been developed for this purpose, wide variations exist in uptake of HBV vaccination across the globe even among healthcare workers. Complete vaccination against hepatitis B is achieved by administration of a three-dose regimen, with the second and third doses being given one and six months after the initial dose. In addition to the fact that a high proportion (75%) of health workers in the United States have been vaccinated against HBV infections, plans already exist to achieve 98% hepatitis B vaccination coverage among HCWs thus providing a bench mark for the elimination of occupational acquired HBV infection (Dannetun et al., 2006). While 79% of HCWs in Sweden had received at least one dose of vaccine, only 40% were reported to be fully vaccinated; and vaccination coverage was found to be 48.2% among dental workers in Japan (Kawaguchi et al., 2005).

Findings from studies in Nigeria indicated very low uptake of hepatitis B vaccination among healthcare workers in the country despite good knowledge of HBV transmission, its prevention and risk perception of occupational exposure to the virus (Kesieme et al., 2011; Samuel et al., 2009).

The dearth of literature on knowledge, risk perception and hepatitis B vaccination status of health workers in Sokoto constitutes a major challenge to the prevention and control of the disease among this high risk group in this part of the country. This study was therefore conducted to address this challenge.

MATERIALS AND METHODS

The study was conducted at the Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria, in the months of February to April, 2013. The hospital serves the inhabitants of Sokoto State, neighboring Kebbi and Zamfara states, as well as people from neighboring Niger Republic. It has a bed capacity of 650, staff strength of 2093, and consists of 42 departments out of which 24 offer clinical services in the form of preventive, curative and rehabilitative services apart from the laboratory units that only carry out investigations.

The study populations included doctors, nurses, laboratory personnel and ward attendants/porters. The sample size was estimated at 124 using the statistical formula for estimating the sample size for descriptive studies (Araoye, 2004), 8.4%

Table 1. Socio-demographic profile of respondents.

Variables	Frequency (%) n=124
Age groups (in years)	
20-29	37 (29.8)
30-39	36 (29.0)
40-49	23 (18.5)
50-59	8 (6.5)
60-69	1 (0.8)
No response	19 (15.3)
Sex	
Male	54 (43.5)
Female	70 (56.5)
Marital status	
Single	21 (16.8)
Married	99 (79.2)
Divorced	4 (3.2)
Religion	
Islam	86 (69.4)
Christianity	37 (29.8)
Others	1 (0.8)
Cadre	
Doctor	12 (9.7)
Nurse	69 (55.6)
Laboratory personnel	20 (16.1)
Ward attendant/porter	23 (18.5)
Duration of service (in years)	
1 and below	30 (24.2)
2 - 11	58 (45.2)
12 - 21	18 (14.5)
22 and above	16 (11.9)
No response	4 (3.2)

prevalence of hepatitis B vaccination among health workers from a previous study (Izegbu et al, 2006), adjustment for a finite population of 2093 health workers in UDUTH (obtained from institutional records), precision level of 5% and an anticipated response rate of 90%. A two-stage sampling technique was employed in selecting the study subjects; five of the 24 departments involved in clinical services were randomly selected by balloting, and in the selected departments, the study subjects were selected (in direct proportion to the staff strength) by systematic sampling technique using the staff list in the respective departments to constitute the sampling frame.

A set of pretested, semi-structured, interviewer administered questionnaire was used to obtain information on respondent's socio-demographic characteristics, knowledge of HVB infection, risk perception and hepatitis B vaccination status. The questionnaire was adapted from the instrument used in previous studies with slight modifications (Habiba et al., 2012; Kesieme et al., 2011; Samuel et al., 2009). It was reviewed by senior colleagues in the Department of Community Health, Usmanu Danfodiyo University, Sokoto, to ascertain content validity. Pretesting of the questionnaire was done among 20 healthcare workers in two other clinical departments not selected for the study; the instrument demonstrated good internal consistency (Cronbach's alpha = 0.80), and appropriate modification was also made based on the observations made during the pretest. Four resident doctors assisted in questionnaire administration after pre-training on conduct of survey research, the objectives of the study, selection of study subjects and questionnaire administration. Institutional ethical clearance was sought from the Ethical committee of Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria. Permission to conduct the study was obtained from the management of the hospital and the heads of the selected departments; informed written consent was also obtained from the participants before data collection.

Data was analyzed using SPSS version 20 computer statistical software package. Study subjects' responses to the knowledge questions were scored and graded. One mark was awarded for correct response, while wrong response or non-response attracts no mark. Respondents that scored 60% or more of expected knowledge were graded as having good knowledge, while those with scores less than 60% of expected knowledge were graded as having poor knowledge. The Chi-square test was used for bivariate analysis involving categorical variables. Logistic regression analysis was used to determine the variables that predict good knowledge of HPV infection, risk perception and hepatitis B vaccination status. All levels of significance were set at $p < 0.05$.

RESULTS

All the 124 questionnaires administered were useable for analysis; the respondents were predominantly females (56.5%) and nurses by profession (55.6%). Their age ranged from 22 to 60 years (mean = 35.19 ± 9.08) with majority (58.8%) in the second and third decades of life. Most of the respondents were married (79.2%) and Moslem by religion (69.4%). Their duration of service ranged from 0.3 to 37 years (median = 5.0), but majority (69.4%) have worked for 11 years and below (Table 1).

Respondents' knowledge of hepatitis B virus infection

Majority of respondents (78.2%) demonstrated good knowledge of hepatitis B virus infection (which comprised of cause, symptoms and signs, transmission, associated risks and prevention). There was no association between good knowledge of hepatitis B virus (HBV) infection and any of the socio-demographic variables ($p > 0.05$). Although majority of respondents (86.3%) knew HBV infection to be caused by a virus, some of them misperceived it to be caused by bacteria (7.3%), parasite (6.5%) and attack by evil spirit (5.6%). While majority of respondents knew the various symptoms/signs of HBV infection such as yellowness of the eyes (88.7%), weakness of the body (82.3%), and passage of dark urine (73.4%), only about half of respondents (52.4%) knew itchy skin as one of its symptoms (Table 2).

Table 2. Knowledge of cause and symptoms/signs of hepatitis B virus infection.

Variables	Response		
	Yes No (%)	No No (%)	I do not know No (%)
Cause of HBV infection			
Bacteria	9 (7.3)	99 (80.0)	15 (12.1)
Virus	108 (86.3)	2 (1.6)	15 (12.1)
Parasite	8 (6.5)	94 (75.8)	21 (16.9)
Evil spirit	7 (5.6)	100 (80.6)	16 (12.9)
Symptoms/signs of HBV infection			
Yellowness of the eyes	110 (88.7)	4(3.2)	9 (7.3)
Weakness of the body	102 (82.3)	7 (5.6)	12 (12.1)
Dark urine	91 (73.4)	13 (10.5)	20 (16.1)
Itchy skin	65 (52.4)	29 (23.4)	29 (23.4)

Similarly, majority of respondents knew the various mode of transmission of HBV infection, the risks associated with the virus and its prevention. Whereas most respondents knew the virus to be transmissible through needle pricks (95.0%) percutaneous injury (73.4%), and from mother to child (82.3%), less than two-thirds of respondents (58.9%) knew the virus to be transmissible through mucus membranes. Also, most respondents considered the virus to be more deadly than HIV (82.3%), a risk factor for liver cancer (71.8%) and transmissible between healthcare workers and patients (93.5%).

While most respondents believed that HBV infection is preventable (92.7%), and that complete immunization with 3 doses of vaccines protects from hepatitis due to the infection (68.5%), a large proportion of respondents believed that the disease is curable (62.1%) as shown in Table 3.

Risk perception of hepatitis B virus infection among respondents

Most, 116 (93.5%) of the 124 respondents perceived themselves to be more at risk of hepatitis B virus infection as compared to the general population by virtue of their profession. While all the doctors (100.0%) and almost all the nurses (98.6%) and laboratory personnel (95.0%) perceived themselves to be at increased risk of the infection, a statistically significantly lower proportion of the ward attendants and porters (73.9%) perceived themselves to be at increased risk of the infection (Fisher's Exact $\chi^2 = 12.829$, $p = 0.002$) as shown in Table 4.

The doctors, nurses and laboratory personnel were seventeen times more likely to perceive themselves to be at risk of the infection as compared to ward attendants and porters (Odds ratio (OR) = 17.471, 95% Confidence Interval (CI) = 3.253 – 93.833, p = 0.001).

Respondents' hepatitis B vaccination status

Uptake of HBV vaccine was poor among the respondents, only 50 (40.3%) of the 124 respondents have ever been vaccinated against HBV infection. In addition, only 28 (56.0%) of the 50 respondents that have been vaccinated against the infection had the recommended three doses of the vaccine. The commonest reasons given for lack of vaccination by most of the respondents were lack of awareness of where to obtain the vaccine (57.1%), the vaccine not being recommended for them (17.1%) and fear of vaccine side effects (14.3%) as shown in Table 5. A statistically significantly lower proportion of ward attendants and porters (13.0%) were vaccinated against HBV infection as compared to laboratory personnel (30.0%), doctors (41.7%) and nurses (52.2%), $\chi^2 = 12.025$, $p = 0.007$.

The doctors, nurses and laboratory personnel were about six times more likely to have been vaccinated against HBV infection as compared to ward attendants and porters (Odds ratio (OR) = 5.802, 95% confidence interval (CI) = 1.622 – 20.764, p = 0.007).

DISCUSSION

Majority (78.2%) of the respondents in this study demonstrated good knowledge of hepatitis B virus (HBV) infection. This finding is encouraging considering the fact that knowledge is an important factor for behavioral modification. This finding is in concordance with the 80% prevalence of good knowledge of HBV infection among health care workers reported in a study by Kesieme et al.

Table 3. Knowledge of transmission, risks and prevention of hepatitis B virus infection.

Variables	Response		
	Yes No (%)	No No (%)	I don't know No (%)
Transmission of HBV infection			
Can occur through mucus membranes	73 (58.9)	30 (24.2)	21 (17.0)
Can occur through percutaneous injury	91 (73.4)	8 (6.5)	25 (20.0)
Can be through needle pricks	118 (95.0)	3 (2.4)	3 (2.4)
Mother to child transmission can occur	102 (82.3)	3 (2.4)	3 (2.4)
Risks associated with hepatitis B virus			
It is present in high concentration in body fluids	96 (77.4)	3 (2.4)	25 (20.2)
It is more deadly than HIV	102 (82.3)	13 (10.5)	8 (6.5)
It can cause liver cancer	89 (71.8)	7 (5.6)	27 (21.8)
Cross infection can occur between health care workers and patients	107 (93.5)	3 (2.4)	13 (10.5)
Prevention of hepatitis due to HBV infection			
Hepatitis can be prevented	115 (92.7)	3(2.4)	6 (4.8)
Complete immunization with 3 doses of vaccines prevents the disease	85 (68.5)	2 (1.6)	34 (27.4)
Hepatitis can be cured	77 (62.1)	27 (21.8)	19 (15.3)

Table 4. Risk perception of hepatitis B virus infection among respondents.

Cadre	Risk perception		Test of significance
	Yes Frequency (%)	No Frequency (%)	
Doctor	12 (100.0)	0 (0)	
Nurse	68 (98.6)	1 (1.4)	FEχ^2 = 12.829
Laboratory personnel	19 (95.0)	1 (5.0)	p = 0.002
Ward attendant/porter	17 (73.9)	6 (26.1)	

(2011), and the 81% prevalence of good knowledge of transmission and prevention of HBV infection obtained in another study among health care workers in Southern Nigeria (Samuel, 2009).

Findings from studies outside Nigeria also reported good knowledge of hepatitis as documented from Kuwait (Habiba et al., 2012) which showed that health workers in Kuwait have good knowledge of hepatitis (76.2%). Similarly, Koria and Lala (2012) in Pakistan and Foster et al. (2010) in Jamaika had the same results. However, the finding from this study is at variance with that reported in a study in Karachi by Habib et al. (2011) who found that the overall knowledge of the health workers studied was inadequate.

Risk perception is the subjective judgment that people make about the characteristic and severity of a risk. In this study, it was noted that majority, 116 (93.5%) of the health workers perceived themselves to be more at risk of HBV infection than the general population. This finding is comparable to that of Habiba et al. (2013) where it was observed that 62.5% of the health workers perceived themselves to be more at risk of contracting HBV infection. This is slightly higher than the findings of Okeke et al. (2008) who noted that 88.7% of the health workers had high risk perception of contracting the infection. It was also higher than that of Ibekwe and Ibeziako (2006) in which 50.4% of the health workers felt that their job exposes them to increased risk of contact with materials potentially contaminated with hepatitis B virus. Bakry and his colleagues (2012) found lower figures in their study as compared to the figure obtained in this study; they observed that less than 50% of the health workers they studied did not fully appreciate their risk of occupational exposure to the infection, in addition to poor knowledge of standard universal precautions.

Despite the fact that ward attendants and porters are known to be frequently exposed to healthcare wastes that could contain infected blood and body fluids, the ward attendants and porters in this study demonstrated very low risk perception of HBV infection, as they were found

Table 5. Respondents' hepatitis B vaccination status.

Variables	Frequency (%)
Vaccination status (n = 124)	
Vaccinated	50 (40.3)
Not vaccinated	74 (59.7)
Received recommended 3 doses (n = 50)	
Yes	28 (56.0)
No	22 (44.0)
Reason for lack of vaccination (n = 70)	
Not at risk of the infection	5 (7.1)
Vaccine not being recommended for them	12 (17.1)
Fear of side effects of vaccine	10 (14.3)
Don't know where to obtain the vaccine	40 (57.1)
Vaccine not offered by the hospital routinely	2 (2.9)
Too busy at work	1 (1.4)

to be seventeen times less likely to perceive themselves to be at risk of the infection as compared to doctors, nurses and laboratory personnel. Addressing this is of public health importance because it could negatively influence their compliance with safe healthcare waste disposal practices and other preventive measures against the disease.

Despite the fact that majority of respondents (86.3%) had good knowledge of hepatitis B viral infection, and most of them (92.7%) perceived themselves to be at increased risk of the infection as compared to the general population, only 50 (40.0%) of the 124 respondents were vaccinated against the infection, and only 28 (56.0%) of the 50 respondents that were vaccinated had the recommended three doses of the vaccine. This finding is a cause for concern because of the inevitable risk of majority of the respondents contracting hepatitis B viral infection following accidental exposure to infectious healthcare wastes. Worst of all, uptake of hepatitis B vaccination was abysmally low among wards attendants and porters (13.0%), and they were about six times less likely to have had HBV vaccination as compared to doctors, nurses and laboratory personnel. This could be related to their low risk perception of HBV infection and it underscores the need for a concerted effort in promoting preventive practices against the infection among them. Reports from other studies generally showed poor uptake of hepatitis B vaccine. Findings of studies by Kesieme et al. (2011) and Koria and Lala (2012) showed even lower uptake of hepatitis B vaccine among health care workers of 35.5 and 35.0% respectively. Lower values of 22.4 and 20% were observed by Ibekwe and Ibeziako (2006) and Azado et al. (2012), respectively. Izegbo et al. (2006) and Ziraba et al. (2010) noted that only 8.4 and 6.2% of their respondents were vaccinated, respectively. However, an encouraging higher value was noted in the study by Al-Hussami (2004) where 85% of the health workers were immunized against the disease. Other researchers that recorded values higher than that observed in this study include estimates of 59% by Samuel et al. (2009) in southern Nigeria, 57% by Chandhari et al. (2009) in India and 84.0% by Habiba et al. (2012) in Kuwait.

Conclusion

This study demonstrated poor uptake of hepatitis B vaccination among HCWs in UDUTH, Sokoto, Nigeria, despite good knowledge and high risk perception. Periodic education of staff on prevention of transmission of blood and other body fluids borne pathogens in the hospital setting, and promotion of accessibility to vaccines against relevant vaccine preventable diseases in the healthcare facilities are hereby suggested.

Conflict of interests

The authors have not declared any conflict of interests.

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Relationship between dietary practices, physical activity and body mass indices of type 2 diabetics attending a clinic in Accra, Ghana

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Data on dietary practices, physical activity and body mass indices of type 2 diabetics in Ghana is scanty. This study therefore assessed relationships between dietary practices, physical activity, and body mass indices of type 2 diabetic patients using a cross-sectional survey. One hundred and twenty type 2 diabetic patients were purposely recruited from the Diabetes Centre at the Korle-Bu Teaching Hospital in Accra, Ghana. Data were collected using a structured questionnaire, dietary assessment methods, anthropometry and a modified Global Physical Activity Questionnaire. Data obtained were analyzed using the Statistical Package for Social Sciences software (SPSS version 20.0) and ESHA-Food Processor Nutrient Database Software (Version 10). The Pearson correlation coefficient was used to test the associations at 5% level of significance. Most (88%) respondents had lived with diabetes for a year or more and majority (95%) ate 3 times daily with or without snacks. Both male and female respondents exceeded the recommended intakes for protein, calcium, vitamins A and C, and niacin. Energy intakes were however below the recommended values in both males and females. Respondents' level of physical activity was generally low (67%). Thirty eight percent had normal weights while 62% were either overweight or obese. There was a positive correlation and statistically significant relationship between diet quality and body mass index (BMI: r^2=0.217; p= 0.017). Level of physical activity and BMI were also positively correlated and statistically significant ($r^{2=}$0.213; p=0.019). Diet quality and physical activity have positive influences on the BMIs of respondents. Overweight and obese respondents need to be advised by health professionals on physical activities and proper diet to achieve healthy weights to avoid complications related to diabetes mellitus.

Key words: Dietary practices, diet quality, physical activity, body mass index (BMI), diabetes.

INTRODUCTION

Diabetes mellitus (DM) is a metabolic disease characterized by hyperglycemia resulting from defects in insulin secretion or insulin action or both (Begum et al., 2004). It is a major health problem worldwide and many factors contribute to its onset. These include diet, obesity, and sedentary lifestyles (Zimmet et al., 2001; Sobal, 2001; Kyiamah, 2009), genetic factors, insulin resistance, age and lifestyle changes as a result of urbanization

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(Ramachandran, 2004). Amoah and co-workers (2002) reported prevalence of type 2 diabetes mellitus to be 6.4% for adults aged 25 years and above in Ghana and further indicated that type 2 diabetes mellitus was associated with age and obesity. Again epidemiological data suggest interactions between acculturation, urbanization, and genetic disposition to be involved in development of type 2 diabetes mellitus among Ghanaians (Cooper and Rotimi, 1997; Saleh et al., 2002; Banini et al., 2003). Research suggests that about 23% of adults in Ghana are overweight, and this has been related to advanced age, female gender, urban environment, high income and tertiary education (Amoah et al., 2002; Amoah, 2003).

Diabetes is managed by dietary control, exercise and where applicable, by oral hypoglycemic agents and/or insulin. The aim of such measures is to maintain normal blood glucose level and prevent complications (Begum et al., 2004). Primary prevention of diabetes includes the promotion and adoption of healthy lifestyles such as establishing healthy eating patterns, achieving and maintaining healthy body weights and increasing physical activity. The progress of disease complications may be reduced if appropriate dietary practices are adhered to. Studies report that diet control can improve glycemic control and may reduce glycosylated hemoglobin (HbA1c) by 1.0 to 2.0% (Pastors et al., 2002; Pi-Sunyer et al., 1999; Kulkarni et al., 1998).

Physical activity plays a vital role in preventing and managing type 2 diabetes (Knowler et al., 2002; Boule et al., 2001; Tuomilehto et al., 2001; Pan et al., 1997). Exercise increases insulin sensitivity, reduces glycol-sylated hemoglobin levels, and also improves lipid profiles (Gordon et al., 2009). According to Motala and Ramaiya (2010), increasing rates of urbanization has led to reduced physical activity and reliance on motorized transportation in Ghana. The prevalence of physical inactivity has been reported to be 13% among West Africans including Ghanaians. Physical activity recom-mendations in Ghana are based on the World Health Organization guidelines which recommend a minimum of 30 min of moderate physical activity for at least five days per week (Ministry of Health, Ghana, 2010). It has been observed in prospective cohort studies that people who maintain a physically active lifestyle develop impaired glucose tolerance and type 2 diabetes mellitus less often than those with a sedentary lifestyle (Hu et al., 1999; Burchfiel et al., 1995; Helmrich et al., 1991). Reviews on exercise in diabetes patients have revealed the importance of exercise in the diabetes management plan. Regular exercise improves blood glucose control and reduces cardiovascular risk factors, maintain proper weight, blood pressure, fat levels and improve well-being. Furthermore, regular exercise may prevent type 2 diabetes in high-risk individuals (Ruderman and Schneider, 1990; Wasserman and Zinman, 1994; Williams, 2001). Both observational studies and intervention trials have shown strong beneficial effects of physical activity in reducing insulin resistance and glucose intolerance (Dunstan et al., 2004; Ezzati et al., 2004; Healy et al., 2008).

Studies have shown a higher prevalence of type 2 diabetes mellitus in Ghana than previously thought. This prevalence is higher than that of the world's estimate which raises concern that needs to be critically addressed. Again, studies have revealed that rapid urbanization has led to changes in food consumption patterns, physical inactivity and prevalence of obesity in adult Ghanaians. It is in this light that this study was conducted to assess the relationship between dietary practices, level of physical activity and body mass indices of Type 2 Diabetics in Ghana. The findings of the study will highlight some of the nutrition problems faced by diabetics to guide nutrition education during counseling sessions at various hospitals in Ghana.

METHODOLOGY

Study design, location and population

This study, which was a cross-sectional survey, was carried out at the National Diabetes Management and Research Centre at Korle-Bu Teaching Hospital (KBTH) in the Greater-Accra Region of Ghana. The center serves as the Diabetic Clinic of the KBTH. Korle-Bu Teaching Hospital is one of the two tertiary health facilities in Ghana and a referral hospital; so it was envisaged that it would have a higher number of Type 2 diabetic patients to select a sample from. The target population was adults diagnosed with Type 2 diabetes visiting the Diabetes Centre. Both male and female diabetic patients aged 18 years and above who reported for regular clinic visits were eligible for inclusion.

Sample and sampling procedure

Purposive sampling technique was used to select participants who were willing to participate in the study. On clinic days, while patients were waiting to see the doctor, the researchers explained the purpose of the study to the patients and assured them of the confidentiality of the responses, after which their cooperation was solicited. This procedure was followed on each clinic visit until the end of the data collection period. Patients of established DM2 status and willing to participate in the study were selected. In all 120 diabetic patients were selected and participated in the study.. The data were collected between July 29, 2013 and October 2, 2013 on week days.

Data Collection

Instruments for data collection

The instruments used for data collection included a structured questionnaire, a 24-h dietary recall, a food frequency questionnaire, anthropometry and the Global Physical Activity Questionnaire (GPAQ).

A structured questionnaire consisting both open-ended and closed-ended questions was used to obtain information on respondents' background characteristics and dietary practices. Dietary practices of respondents were assessed using five dietary practice-related questions by which respondents were classified as

having good, fair or poor dietary practices. The response to each question was scored either 0 for inadequate practice or 1 for adequate practice. The highest attainable score was 5 and minimum score was 0. Scores of respondents were classified as follows: respondents with scores of 5 were classified as having good dietary practices; scores of 4 as fair dietary practices; scores between 0-3 as poor dietary practices.

A food frequency questionnaire (FFQ) comprising 71 commonly consumed food items from the Ghana Six Food Groups was used to determine the frequency of food consumption. The responses were used to provide descriptive information about respondents' habitual food consumption patterns, dietary diversity and hence dietary quality (classified as adequate, fair or poor). Diets including at least one food item from 5 to 6 food groups daily were rated as adequate; diets including at least one food item from 4 food groups daily were rated as fair; Diets including a food item from 3 or less food groups were rated as poor.

A 24-h dietary recall method was used to determine the energy and nutrient intakes of respondents. Estimated portions of the various food items consumed by the respondents in the 24-h dietary recall were converted into weights of food in grams using a food conversion table for analysis of energy and nutrients. The energy and nutrient contents of foods were calculated using the ESHA Food Processor Plus Software (Version 10). Adequacy of respondents' nutrient intakes were evaluated by comparing the computed values of energy and nutrient intakes of male and female respondents to the Recommended Nutrient Intakes (RNIs) by WHO/FAO (2004).

The levels of physical activities of respondents were assessed using a modified Global Physical Activity Questionnaire (GPAQ) by World Health Organization (2002). Physical activity was classified as low, moderate and high using the GPAQ (WHO, 2002).

Weights and heights measurements were used to determine respondents' body mass indices (BMIs) following standard procedures described by Gibson (2005). The World Health Organization classification was used to assess nutritional status of the respondents. BMI was classified as underweight, normal, overweight, and obese (WHO, 2000).

Data analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS Version 20.0). Means and standard deviations were generated for continuous variables and frequencies for categorical variables. Pearson's correlation coefficient statistic was used to test associations between dietary practices, physical activity and BMI of respondents at 5% level of significance

Ethical consideration

Ethical approval for the study was granted by Noguchi Memorial Institute for Medical Research (NMIMR) Institutional Review Board (IRB), University of Ghana, Legon (Reference number: NMIMR-IRB CPN 110/12-13). Verbal consent was obtained from the respondents after details of the nature and procedures of the study were clearly communicated to them. They were also assured confidentiality of the data collected.

Limitations of the study

Limitations experienced in the study involved mainly the research design and the use of the 24 h recall. The purposive sampling technique was used and working in only one health care centre, may not capture a full representation of the wider population of diabetics. Again, estimates of food intakes given by respondents may not be accurate because the 24-h recall relied on the memory of respondents. They may have overestimated or underestimated foods eaten which may affect calculations of energy and nutrient intakes. Notwithstanding these limitations, the results provide some ideas about the dietary practices of the respondents which could be generalized to practices of diabetics in Ghana. For these reasons, conclusions could only be made regarding diabetic patients at the Korle-Bu Teaching hospital. However, inferences could be made regarding dietary practices, physical activity and body mass indices of Type 2 diabetic patients.

RESULTS AND DISCUSSION

Background information of respondents

One hundred and twenty (120) respondents comprising 82 females and 38 males participated in the study. They were aged between 33 and 77 years (with a mean age of 50.7 ± 10.67 years). Seventy-eight percent (78%) were married while the rest were widowed, single or divorced. About 88% of the respondents had formal education ranging between primary and tertiary level. Half (51%) of the respondents were employed in the informal sector as traders and artisans, 27.5% were employed in the formal sector as civil servants, 15% were pensioners and the rest (7%) were unemployed. The average monthly income of the respondents was GH₵ 236.7±148.55. The national daily minimum wage at the time of the study was GH₵5.24 which translates to approximately GH₵162.44 a month (Ghana Statistical Service, 2013). Even though the average monthly income of respondents is greater than the minimum wage of the country, majority (75%) of the respondents were in Ghana's lower income bracket. As such, the harsh economic conditions prevailing at the time of the study is likely to make it difficult for them to prepare good and diversified diets and also purchase their medications which would negatively affect the management of their condition. Majority (88.3%) of the respondents had lived with type 2diabetes for a year or more; 34% for one to five years, and 52.5% having lived with the condition for six years or more.

Dietary practices and nutrient intakes of respondents

Majority (95%) of the respondents ate three times a day with 5% eating twice daily. Amoah et al. (2006) recommended that diabetics should eat three meals a day about the same time every day to maintain a fair control of their blood glucose levels. Respondents in this study seemed to have adhered to this recommendation. Mohammed et al. (2013) in a study in Saudi Arabia, on the contrary, reported fewer respondents (59.9%) who ate three meals daily. Ninety five percent (95%) of the respondents ate breakfast, lunch and supper each day, 3.3% ate only breakfast and supper; and 1.7% ate breakfast and lunch. Most (85%) of the respondents ate either one or two snacks on a daily basis in addition to

Table 1. Mean energy and nutrient intakes of respondents**.

Energy/Nutrients	Male				Female			
	Mean	±SD	RNI*	%RNI	Mean	±SD	RNI*	%RNI
Energy (kcal)	2124.7	341.1	2600	81.7	1870.3	350.8	2100	89.1
Protein (g)	52.2	17.6	49	106.5	47.5	15.7	41	115.8
Calcium (mg)	696.4	350.9	600	116.1	717.9	348.6	600	119.7
Iron (mg)	11.03	5.8	10	110.3	15.94	5.6	18	88.6
Zinc (mg)	5.2	1.6	5.5	94.5	6.05	0.6	5.5	110.0
Vitamin A (µg RE)	1478.0	513.2	600	246.3	1544.2	294.7	500	308.8
Thiamin (mg)	1.01	0.4	1.25	80.8	1.34	0.6	1.0	134.0
Riboflavin (mg)	1.3	0.2	1.5	86.7	1.6	0.4	1.2	133.3
Niacin (mg)	14.9	4.1	13	114.6	21.5	4.7	13	165.4
Vitamin C (mg)	139.2	38.3	30	464.0	163.3	32.7	30	544.3

*RNI values by WHO/FAO (2004). **Intakes obtained from a single 24-h dietary recall.

their meals. Breakfast, lunch, supper and snack consumption as well as meal timing have been reported to play an important role in energy intake and weight management (Taylor et al., 2004). This could help diabetics manage their weights and also properly control blood sugar levels. It is therefore commendable that most respondents consumed three meals and snacks.

Generally, the dietary practices of most respondents were good (71.7%), though, 28.3% had poor to fair dietary practices. According to Pastors et al. (2002), appropriate dietary practices are basic and integral parts of diabetes management and may lead to the reduction of the development of disease complications by improving risk factor profiles. The dietary practices of respondents in this study therefore are encouraging hence they should be urged to continue with the practices to enhance their health status. These findings however differ from the study conducted on dietary practices among patients with type 2 diabetes in Riyadh, Saudi Arabia which revealed inadequate dietary practices of respondents (Mohammed et al., 2013).

Even though 95% of respondents consumed three meals daily, only 67% had good quality and diversified diets. It must be noted however that number of meals consumed may not necessarily be a good measure of diet quality especially if the meals are not diversified. Lack of variety in the diet, skipping meals, and generally low income levels may account for poor or fair diet qualities of some of the respondents.

Table 1 presents the mean energy and nutrient intakes of respondents. Males had a mean calorie intake of 2,124.7 kcal while females had 1,870.3 kcal. Female respondents met 89% of the recommended energy intake while the males met 82% of recommended energy intake. The body needs energy for maintaining metabolic activities, support growth and maintenance and for physical activity. Inadequate intake as observed in this study may lead to breakdown of tissues and fat for energy. This situation is not good for diabetics hence the need to encourage adequate consumption of carbohydrate-based foods, especially the complex. Both male and female respondents exceeded the RNIs for protein, calcium, Vitamin A, Niacin, and Vitamin C.

Description of daily physical activity of respondents

Assessment of physical activity revealed that two-thirds (67%) of the respondents' level of physical activity was low although 95% of the respondents exercised 2 to 5 times in a week. This indicates that the intensity of their exercise was low. Only a third (33%) had moderate level of physical activity (Table 2). According to Warburton et al. (2006), regular physical activity helps prevent some chronic diseases in adults. In some cohort studies in United States, it was observed that persons who maintained physically active lifestyles developed impaired glucose tolerance and type 2 diabetes mellitus less often than do those with a sedentary lifestyle (Hu et al., 1999; Burchfiel et al., 1995; Helmrich et al., 1991). Helmrich et al. (1991) also reported that men who exercised regularly, at moderate or vigorous intensity, had a 35% lower risk of developing type 2 diabetes mellitus than men who were sedentary.

Although health benefits of exercise are well-established, a U.S study by Nelson et al. (2002) revealed that 69% of people with type 2 diabetes did not engage in sufficient physical activity, a finding which is similar to what was observed in this study. As such, developing strategies to increase physical activity in respondents in this present study would be highly desirable. This is because besides the health benefits listed above, physical activity helps increase insulin sensitivity, maintains blood pressure and blood fat levels of the diabetic patient (Williams, 2001). There was no statistically significant difference between the level of physical activity of males and females (p=0.165) in this study sample. However, a statistically significant difference existed between age

Table 2. Frequency of performance and respondents' level of physical activity

Performance/Classification	No.	%
Frequency of physical activity per week		
Once	2	1.7
2-3 times	86	71.6
4-5 times	28	23.3
6-7 times	4	3.3
Level of physical activity		
Moderate	40	33.3
Low	80	66.7
Total	120	100

Table 3. Mean weights, heights and BMIs of respondents.

Measurement	Male	Female	Mean	± SD	Minimum	Maximum
Weight (kg)	63.8	65.2	64.5	9.94	43.0	90.0
Height (m)	1.62	1.61	1.62	0.06	1.49	1.74
BMI (kg/m^2)	24.32	24.96	24.4	3.17	19.11	32.35

Table 4. BMI categorization of respondents

Categorization of BMI	No.	%
Normal (kg/m^2)		
18.50-24.99	46	38.3
Overweight (kg/m^2)		
25.00-29.99	62	51.7
Obese (kg/m^2)		
>30.00	12	10.0
Total	120	100

and level of physical activity of respondents (p=0.043). Physical activity of respondents decreased with age. Diabetics should therefore be encouraged to engage in moderate physical activities as they get older to help improve glycemic control so as to prevent diabetes complications.

Anthropometric measurements of respondents

Mean weights, heights and BMIs of respondents are presented in Table 3. The heights of respondents ranged between 1.49 and 1.74 m, while their weights were between 43 and 90 kg. The mean BMI of the study sample was 24.4 ± 3.17 kg/m^2 which is slightly lower and better than that reported in the study by Danquah et al. (2012) among type 2 diabetics (BMI of 25.9 ± 5.1 kg/m^2) in urban Ghana. Table 4 presents the categorization of BMIs of respondents. About a half (52%) of the respondents were overweight and 10% were obese. Only 38% of the sample had normal BMIs. Findings of this study are similar to a study on type 2 diabetes mellitus in urban Ghana by Danquah et al. (2012). They reported that about a half (53%) of their respondents were overweight. This study also compares well with Abubakari and Bhopal (2008) with respect to prevalence of obesity in West Africa, which was reported to be 10%. This suggests that the findings of this study might be a good representation of what is going on in West Africa.

There was no significant difference between the BMIs of males and females (p=0.336), indicating that BMIs of respondents were not influenced by gender in this study sample. There was a statistically significant relationship between age and BMIs of respondents, with BMI increasing with age (p=0.00). Close to 41% of respondents who were overweight or obese were aged 50 years and above. This finding confirms the report by the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus (2007) that Type 2 diabetes mellitus is more prevalent in older overweight or obese individuals. Respondents should therefore be encouraged to maintain healthy weights as they grow older to help improve glycemic control so as to avoid complications of the disease.

A positive correlation, though weak (r^2 = 0.150), but statistically insignificant (p = 0.101) existed between dietary practices and diet quality of respondents, suggesting that as respondents dietary practices improved, their diet quality would also improve. A positive correlation (r^2= 0.213) existed between level of physical

activity and BMI which was of statistical significance (p = 0.019). This suggests that as respondents' physical activity increased, the BMI also improved. As such, diabetics need to engage in regular moderate physical activities, at least five times a week, to be able to maintain healthy weights. There was also a positive correlation (r^2 = 0.217) between diet quality and BMI which was statistically significant (p = 0.017).

CONCLUSION AND RECOMMENDATION

In conclusion, dietary practices and diet quality of type 2 diabetics attending clinic at Korle-bu Teaching hospital were good but their levels of physical activity were generally low. Overweight/Obesity is however high among the respondents. Whereas dietary practices did not significantly affect diet quality of respondents, as diet quality increased, BMIs improved. Increased physical activity also improved BMIs of respondents.

It is therefore recommended that both overweight and obese diabetics should be encouraged to achieve healthy weights by engaging in moderate physical activities to effectively manage the condition. There is also the need to emphasize education on diet diversity for diabetics to help them make healthy food choices to enable them manage the condition well.

Conflict of interests

The authors have not declared any conflict of interests.

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