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KNOWLEDGE, BELIEVES AND BEHAVIORS OF UNIVERSITY STUDENTS TOWARD OSTEOPOROSIS

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ABSTRACT

Background: Osteoporosis is a rapidly growing chronic disease that progresses silently among women and the elderly increasing the burden on the global healthcare systems. Medical students are considered the channel through which people get aware of the disease and its related risks, hence its prevention. Objectives: To investigate the knowledge, believes, and behavior about osteoporosis among medical and non-medical students of Ajman University of Science and Technology, UAE. Materials & Methods: A self-reported questionnaire was administered to a sample of 400 students at Ajman University, medical and non-medical students, 200 participants in each group. Data were analysed by SPSS version 20 was used for data entry and analysis. Chi square test and independent t-test were used. Results: Majority of the students were aware of osteoporosis general knowledge, signs and symptoms, risk factors and preventive behavior. There was a gap in the knowledge of some points between medical and non-medical students like the recommended amount of calcium intake for an adult per day. Conclusion: Medical students were better than non-medical students in terms of osteoporosis general knowledge and risk factors. The results will be used in developing educational programs that will help to raise awareness, knowledge and believe of university students in the UAE towards osteoporosis especially regarding the adequate calcium intake and healthy dietary intake of nutrients related to bone health.

KEYWORDS: Osteoporosis, knowledge, Behaviors, medical students, non-medical students, calcium, vitamin D.

INTRODUCTION

Osteoporosis presents a growing concern worldwide as it progresses silently and its signs and symptoms are mostly discovered after a fracture has already occurred (WHO, 1994). The total estimated number of people suffering from fractures around the world was 56 million including fractures of hips, vertebrae and forearm. It is also anticipated that by the year 2050, there will be around 6.3 million hip fractures over the world.[1] It is known that factors leading to osteoporosis are complex involving modifiable risk factors such as smoking, people with sedentary life style and weight in case of body mass index is less than 19, this indicates a low bone mineral density.[2] Gender and age are non-modifiable risk factors for getting osteoporosis where females are considerably at higher risk of osteoporosis than males.[2] Having a positive family history of hip fractures after the age of fifty years boosts the risk of getting fractured.[3] According to Cummings et al 1993[4], individuals who have already had a fracture, are at a high risk to get second episodes. Once an individual contracts osteoporosis, fractures take place at any bone in the body. This complication takes place mostly in the hip bones, wrists and spine.[5] There are a number of research reports in the literature which has investigated the level of knowledge, believes and behaviors regarding osteoporosis. A study was performed by Edmonds et al., 2012[6] on osteoporosis knowledge and beliefs among college students found that the majority of the students did not perceive them-selves as susceptible to osteoporosis; this was consistent with De Silva et al. 2014.[7] Another study in USA to assess the level of osteoporosis knowledge and beliefs among 302 young women in Southeastern State University showed that the study population strongly believed that osteoporosis is a serious disease, but less serious than heart disease and breast cancer. In addition, they believed that they were somewhat susceptible to osteoporosis, but less than heart disease and breast cancer.[8] Other findings in Taiwan, among 265 young adult women aged between 30–45 years reported that women were aware of the risk of osteoporosis but they felt that prevention was difficult.

Furthermore, they had the opinion that osteoporosis is not serious and that taking preventative measures would not be beneficial.[9]

The majority of participants in Edmonds et al., 2012[6] study were unable to identify the risks of osteoporosis in white women, the risks that come with the removal of ovaries and the benefits to big-boned individuals. These findings were parallel to the findings by El-Sayed and

Abdel Megeid, (2013)[10] where poor knowledge about cigarette smoking and caffeine intake, soda drinks, treatment and prevention was reported. Regarding findings related to calcium intake among students, several studies had shown low calcium intake.[7,9,11]

As students represent an educated group of people, it's crucial to understand what they knew about the disease and to what extent they practice preventive behaviors towards osteoporosis, therefore developing an educational intervention program based on study of existing beliefs. Thus, this study aimed to assess the degree of osteoporosis knowledge among the students at Ajman University, to raise the awareness of beliefs and behavior regarding osteoporosis, in order to understand the risk factors and the preventive health habits to avoid contracting this disease, and to compare these between medical (MS) and non-medical students (NS).

MATERIALS AND METHODS

We conducted a cross- sectional study on selected 400 students from Ajman University of Science and Technology in United Arab Emirates (UAE). A total sample of 200 medical students was enrolled from faculties of pharmacy and dentistry (first to fifth year) and 200 non-medical students; from faculties of non-medical colleges.

Study design and population

A cross-sectional survey using a self-administered questionnaire was conducted between January 2015 to May 2015 among undergraduate medical and non-medical students. Before starting this study a signed consent form was obtained from participating students. A questionnaire was designed and validated for two objectives:[1] to investigate the knowledge, believes and behaviors regarding osteoporosis risk factors and the preventive health habits such as adequate calcium intake and physical activity among university Students in Ajman; and[2] to compare the knowledge and awareness to osteoporosis between medical and non-medical students.

The questionnaire was field-tested several times on a pilot sample of 50 students to clarify any ambiguities and to determine the reliability of the questionnaire. The questionnaire consisted of six sections; demographic information, osteoporosis general knowledge, osteoporosis risk factors, osteoporosis signs and symptoms, osteoporosis preventive behaviors, calcium intake and eating habits.

Statistical Analysis

All questions were coded and then imported to SPSS version 20 for analysis. Descriptive statistics was used to analyze the socio-demographic data. Chi-square test was used to assess the association between categorical variables. Chi- square test was used to compare the knowledge level between medical & non-medical students. A $p < 0.05$ was considered statistically significant. The independent t-test was preformed to find the overall score of the students regarding osteoporosis knowledge.

RESULTS

Five hundred questionnaires were distributed among medical & non-medical students, 400 were returned with a response rate of 80%. The socio-demographic characteristic of the enrolled students are listed Table (1).

The results of each question were related to osteoporosis general knowledge, signs & symptoms, risk factors and preventive behaviors among medical and non-medical students were analyzed using $\chi 2$ test. Table 1 shows the frequency and percentage of demographic variables. The majority of subjects were Arabs, single, and did not complain of bone disease. Table 2 shows general knowledge of the participants of osteoporosis. Ninety six percent have heard of osteoporosis, 45% could define osteoporosis, 75% knew future osteoporosis risk and 88% indicated that osteoporosis is a serious. There was a high significant difference in "defining osteoporosis" and "knowledge of osteoporosis: between medical and non-medical students. Table 3 shows knowledge about osteoporosis signs and symptoms. Seventy five percent of students knew fracture of bone, 72% knew humped spine, 47% knew loss of height and 81% knew back pain. There was a very high significant difference in the knowledge of "fracture of bone" between medical and non-medical students. Table 4 shows knowledge of osteoporosis risk factors. Ninety seven percent knew that "low calcium intake" is a risk factor and only forty six percent knew that "high salt diet" is a risk factor. There was a very high significant difference between medical and non-medical regarding risk factors like female gender, ageing, positive family history, and early menopause. Table 5 shows knowledge regarding osteoporosis preventive behavior. Eighty nine percent identified that regular exercise provides protection, 97% identified that calcium rich food provide protection, and 67% identified that smoking cessation provides protection. Table 6 shows mean (SD) of general knowledge, signs and symptoms and preventive behavior regarding osteoporosis in medical and non-medical students. There was a high significant differences in general knowledge and risk factor for osteoporosis between medical and non-medical students. Table 7 shows the knowledge of students about the recommended amount of calcium intake, type of milk, amount of milk and vegetables in adults.

Table 1: Demographic characteristics of the participants

Character	n (%)
Age	17 -38
Mean age ± S.D	21.9±2.8
Nationality:	
Local	68 (17%)
Arabs	292 (73%)
Others	40 (10%)
Marital status:	
Single	362 (90.5%)
Married	38 (9.5%)
Complain from bone disease:	
Yes	43 (10.8%)
No	357(89.3%)
Major :	
Medical	200 (50%)
Non-medical	200 (50%)
Study year:	
1st	37 (9.3%)
2nd	64 (16%)
3rd	108 (27%)
4th	142 (35.5%)
5th	49 (12.3%)

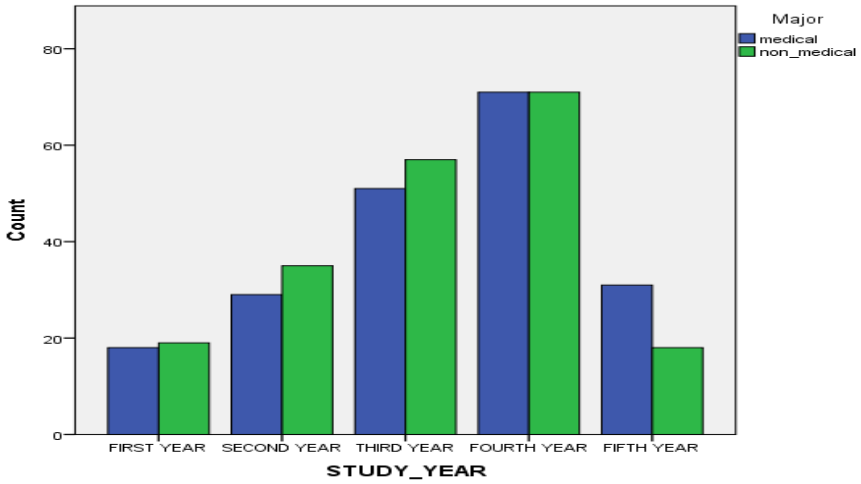

Figure 1: Distribution of participants according to major & study year

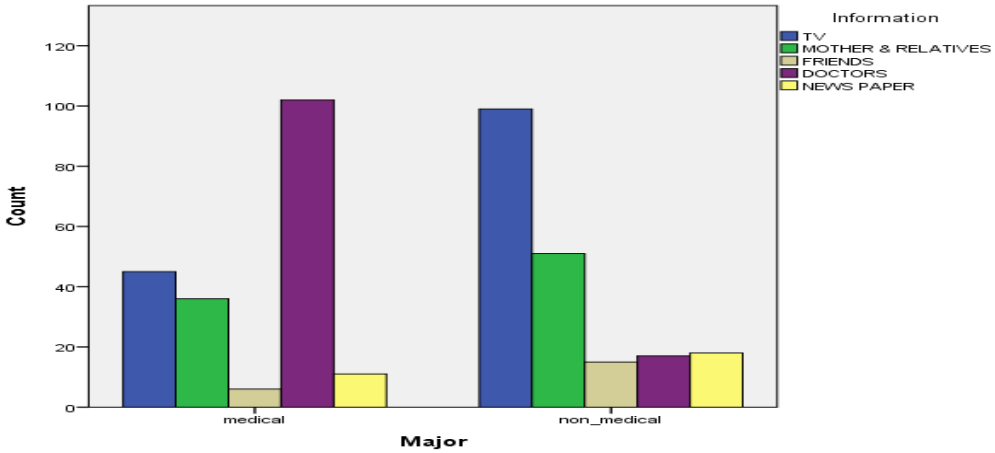

Figure 2: Distribution of participant according to source of information

Table 2: Student's General Knowledge on Osteoporosis

Question (response)	All Subjects n %	MS n %	NS n %	X2	*P*
Have you heard about osteoporosis? (yes)	384 (96)	194 (97%)	190 (95%)	1.042	0.307
Can you define osteoporosis? (correct definition)	182 (45.5)	116 (58%) ***	66 (33%)	25.204	0.001
Do you know future osteoporosis risk?(yes)	300 (75)	169 (84.5%) ***	131 (65.5%)	19.253	0.001
Is Osteoporosis a serious disease as heart disease & breast cancer?	353 (88.3)	181 (90.5%)	172 (86%)	1.953	0.162
MS: medical student, NS: non-medical student, ***p <0.001; χ^2 = chi- square					

Table 3: Student's Knowledge About Osteoporosis Signs and Symptoms

Question (response)	All Subjects n %	MS n %	NS n %	X2	*P*
Fracture of bone	301 (75.3%)	168 (84%) ***	133 (66.5%)	16.444	0.001
Humped spine	289 (72.3%)	145 (72.5%)	144 (72%)	0.012	0.911
Loss of height	190 (47.5%)	94 (47%)	96 (48%)	0.04	0.841
Back pain	322 (80.5%)	160 (80%)	162 (81%)	0.064	0.801
MS: medical student, NS: non-medical student, ***p <0.001 χ^2 = Chi- square					

Table 4: Student's Knowledge on osteoporosis risk factors

Question (response)	All Subjects N %	MS n %	NS n %	X2	*P*
Is being a female a risk factor? (yes)	225 (56.3%)	136 (68%) ***	89 (44.5%)	22.441	0.001
Is ageing a risk factor? (yes)	359 (89.8%)	190 (95%) ***	169 (84.5%)	11.985	0.001
Is cigarette smoking a risk factor? (yes)	215 (53.8%)	103 (51.5%)	112 (56%)	0.815	0.367
Is positive Family history of osteoporosis a risk factor? (yes)	270 (67.5%)	156 (78%) ***	114 (57%)	20.103	0.001
Is lack of activity a risk factor? (yes)	304 (76%)	155 (77.5%)	149 (74.5%)	0.493	0.482
Is low calcium intake a risk factor? (yes)	387 (96.8%)	194 (97%)	193 (96.5%	0.08	0.778
Is early menopause ~~is~~ a risk factor? (yes)	225 (56.3%)	138 (69%) ***	87 (43.5%)	26.423	0.001
Is high salt diet a risk factor? (yes)	185 (46.3%)	96 (48%)	89 (44.5%)	0.493	0.483
Are previous fractures a risk factor? (yes)	207 (51.8%)	112 (56%)	95 (47.5%)	2.894	0.089
MS: medical student, NS: non-medical student, ***p <0.001 χ^2 = Chi- square					

Table 5: Student's Knowledge on osteoporosis preventive behaviors

Question (response)	All Subjects n %				
		MS n %	NS n %	X2	*P*
Regular exercise can protect against osteoporosis? (yes)	354 (88.5%)	178 (89%)	176 (88%)	0.098	0.754
Eating calcium rich foods protect against osteoporosis? (yes)	389 (97.3%)	196 (98%)	193 (96.5%)	0.841	0.359
Smoking cessation protect against osteoporosis? (yes)	269 (67.3%)	135 (67.5%)	134 (67%)	0.011	0.915
MS: medical student, NS: non-medical student, χ^2 = chi square					

Table 6: Student's total score on osteoporosis

Student Score	All Subjects Mean (SD)				
		MS Mean (SD)	NS Mean (SD)	t	*P*
General Knowledge	2.65 (1.27)	3.045 (1.12) ***	2.255 (1.29)	6.518	0.001
Signs and symptoms	2.755 (1.08)	2.8350 (1.08)	2.6750 (1.08)	1.47	0.142
Risk factors	5.9425 (1.83)	6.400 (1.68) ***	5.4850 (1.86)	5.143	0.001
Preventive behavior	2.5300 (0.67)	2.5450 (0.64)	2.5150 (0.71)	0.442	0.659
MS: medical student, NS: non-medical student, ***p <0.001; t: independent t value					

Table 7: shows the student response to questions related to calcium nutrition and eating habits

Question	Response	Specialization		
		All Subjects (n=400) n %	MS (n=) n %	NS (n=200) n %
*Which of the following is the recommended amount of calcium intake for an adult per day?	100mg-300mg daily 400mg-600mg daily 800mg or more Don't know	35 (8.8%) 81 (20.3%) 26 (6.5%) 258 (64.5%)	17 (8.5%) 52 (26%) 15 (7.5%) 116 (58%)	18 (9%) 29 (14.5%) 11 (5.5%) 142 (71%)
*Do you drink milk?	Yes No	302 (75.5%) 98 (24.5%)	153 (76.5%) 47 (23.5%)	149 (74.5%) 51(25.5%)
*What is the type of milk you consume?	Skimmed Half cream Full cream	57 (14.3%) 130 (32.5%) 213 (53.3%)	32 (16%) 66 (33%) 102 (51%)	25 (12.5%) 64 (32%) 111(55.5%)
*How many times you drink milk?	Daily 3 or 4/week 1 or 2 / week Rarely	93 (23.3%) 200 (50%) 82 (20.5%) 25 (6.3%)	31 (15.5%) 105 (52.5%) 46 (23%) 18 (9%)	62 (31%) 95 (47.5%) 36 (18%) 7 (3.5%)
*How many times do you eat Green leafy vegetables?	Daily 3 or 4/week 1 or 2 / week Rarely	180 (45%) 87 (21.8%) 78 (19.5%) 55 (13.8%)	97 (48.5%) 49 (24.5%) 34 (17%) 20 (10%)	83 (41.5%) 38 (19%) 44 (22%) 35 (17.5%)
*How often do you eat sardines or tuna?	Daily 3 or 4/week 1 or 2 / week Rarely	11 (2.8%) 65 (16.3%) 125 (31.3%) 199 (49.8%)	4 (2%) 34 (17%) 62 (31%) 100 (50%)	7 (3.5%) 31 (15.5%) 63 (31.5%) 99(49.5%)
*How many times do you eat Cabbage and broccoli?	Daily 3 or 4/week 1 or 2 / week Rarely	23 (5.8%) 39 (9.8%) 132 (33%) 206 (51.5%)	12 (6%) 16 (8%) 69 (34.5%) 103 (51.5%)	11 (5.5%) 23 (11.5%) 63(31.5%) 103 (51.5%)
*How many times do you eat Cheese?	Daily 3 or 4/week	178 (44.5%) 69 (17.3%)	94 (47%) 34 (17%)	84 (42%) 35 (17.5%)

	1 or 2 / week Rarely	37 (9.3%) 116 (29%)	19 (9.5%) 53 (26.5%)	18 (9%) 63 (31.5%)
***How many times do you eat Legumes?**	Daily 3 or 4/week 1 or 2 / week Rarely	34 (8.5%) 67 (16.8%) 75 (18.8%) 224 (56%)	13 (6.5%) 35 (17.5%) 28 (14%) 124 (62%)	21 (10.5%) 32 (16%) 47 (23.5%) 100 (50%)
MS: medical student, NS: non-medical student n: number, %: percentage				

DISCUSSION

This study surveyed medical students and non-medical students from Ajman University of Science and Technology to assess their knowledge, Beliefs, and Behavior about osteoporosis in the form of questionnaires. Our study showed that three hundred and eighty four participants (96%) heard about osteoporosis. These results showed that most participants have paid much attention to osteoporosis. This was consistent with Kasper., et al (2006) study (8) which found that 98% of their subjects heard some or a lot about osteoporosis. Another study on employees in different colleges from King Saud University in Riyadh showed that 63% of the employees have heard about osteoporosis (10), this was in accordance with the study of Chang M F, 2006 (9) which showed 64.2%. On the other hand, lesser proportion was obtained in Puttapitakpong et al. 2014 study (12) where only 49.5% heard about osteoporosis.

In our study only 45.5% of the students defined osteoporosis correctly, this was consistent with El-Sayed and Megeid., 2013[10] who concluded that 48% of the students defined osteoporosis correctly. Another study assessed osteoporosis knowledge among female adolescents students in a selected secondary school at El-Minia, Egypt concluded that 38.4 % of the studied sample had no knowledge regarding the meaning of osteoporosis.[13] In contrast, a study by Tayel et al.2013[11] among 300 female students of Alexandria University in Egypt revealed that 81.7% of students correctly defined osteoporosis. This difference might represent a poor or limited knowledge about osteoporosis among surveyed subjects so health educational programs and health services regarding osteoporosis are necessary for our students.

Our finding identified that most of our participants (88.3%) believed that osteoporosis is a serious disease as heart disease and breast cancer. Similar response was observed by El-Sayed and Megeid 2013[10] who claimed that 62% of participants knew that osteoporosis was a serious disease. However, in Kasper et al 2007[8], the women participants did believe very strongly that osteoporosis is a serious disease but significantly less serious than heart disease and breast cancer.

In our study, Television was the first source to provide knowledge about osteoporosis (36%), followed by doctors (29.8%). Previous studies have likewise obtained results consistent with this view that the main source of information about osteoporosis was the television (10, 14 and 15. However, a study in Iran among 401 women aged between 30 and 50 years found that the main external action for nutritional behaviors to prevent osteoporosis was the family (70.6 %).[16]

Our data on signs /symptoms indicates that back pain (80.5%) and fracture of bone (75.3%) were the top two common symptoms identified by the participants. While in a study carried by Wahba et al. 2012[14], fracture of bone and humped spine were the top two symptoms identified by the participants (50.1% and 24.3%, respectively).

Our findings showed that low calcium intake and old age were the most common identified risk factors (96.8% and 89.8%, respectively). In another study[14], advanced age and being a female were the most common identified risk factors. This was also consistent with the study of Hossien et al 2014[13] where 38.4 % of the studied sample didn't know the meaning of osteoporosis, and 75.9 % of them lacked the correct behaviors to avoid osteoporosis.

Moreover in the study of Edmonds et al. 2012[6], the lack of physical activity and low calcium intake were the most common identified risk factors (11%).

Regarding the risk factors for developing osteoporosis, results of the present study revealed that the participants were aware of the risk factors as a high percentage of them were able to identify the risk factors. This is in contrast to another study done by Rafraf et al. 2009[17] who reported that most interviewed subjects (63.2 %) had low knowledge about osteoporosis regarding the concept of the disorder and its risk factors, sex-related factors and prevention behaviors.

About 96.8% of respondents in our study identified that a low calcium intake is a risk for osteoporosis, this was consistent with the 86.1% obtained from another study[8] and in contrast with another study[14] which showed a lesser percentage (26.3%).

The percentage of advanced age as a risk factor among our study participants appeared to be higher (89.8%) compared to other studies; (40.5%)[14], (41.3%)[11] and (29.3%)[13], respectively. Moreover, Silva et al., 2014[7] showed that 43.5% of respondents did not considered old age as a risk factor in her study.

About 85.8% of respondents recognized that sedentary lifestyle is a risk factor for osteoporosis.[8] This was in agreement with our study which concluded that 76% of

respondents identified a lack of activity as risk factor for osteoporosis.

The present study showed that 67.5% of the study participant correctly answered that family history is a risk factor for osteoporosis. A similar response was observed by other study[8] where 89.1% were aware of this view, whereas only 32.3% of respondent in another study[7] were consistent with this view. Furthermore, Edmonds et al., 2012[6] have concluded that 35.4% of participant strongly disagreed with the statement "family history makes it more likely". On the other hand, lesser percentages were observed regarding heredity risk factor by Tayel et al., 2013[11] (14.7%) and Wahba. et al 2012[14] (11.2%).

Gender related risk factor (being a female) identification should be incorporated into student's health care as early as adolescence. This trend was confirmed by 56.3% of study participants who believed that being a female is a risk factor for osteoporosis. This was in agreement with results obtained by Kasper et al., 2006[8] (65.9%), Hossien et al., 2014 (13) (48.4 %) and Tayel et al. 2013[11] (47.3%). However, Wahba et al., 2012 (14) reported that only 34.2% of the participants shared this view.

Our findings showed that 56.3% of respondents believed that early menopause is an osteoporosis risk factor. Similarly, Kasper et al., 2006 (8) found that 41.1% of respondents had the same believe. This was consistent with Tayel et al., 2013 (11) (37.7%). On the other hand, Wahba et al., 2012[14] and Hossien et al., 2014[13] had reported lower percentages of early menopause as risk factor, (3.6%) and (5.4%), respectively.

Cigarette smoking reduces bone mineral density by decreasing the calcium absorption from food. Confusion regarding whether cigarette smoking is a risk factor for osteoporosis varies among studies. Silva et al. 2014[7] concluded that 84.9% of participants did not consider smoking as a risk factor. Similar response was obtained by Wahba et al., 2012[14] who showed that only 6% of the respondents had a positive response. In contrast, our study showed that 53.8% of respondents were aware of this issue and this was in accordance with Kasper et al., 2006[8] and Tayel et al. 2013[11] who reported positive response (44.7%) and (36.7%), respectively.

High consumption of salty food with high content of sodium interferes with calcium absorption and increase urinary calcium excretion. From the results of this study, it was clear that less than half of our students (46.3%) identified that eating salty food is an osteoporosis risk factor which may have a negative effect on calcium levels and bone health. This was in consistence with the study of Tayel et al. 2013[11] that showed a weak percentage (34.7%) among the participants to show knowledge on this factor. Another study by Wahba et al 2012[14] reported lower responses (6%) for salty food as risk factor.

Our findings concluded that 51.8% of all participants were aware that previous fractures are an osteoporosis risk factor, which showed a higher percentage compared to 11.2% obtained by Wahba. et al 2012.[14]

Knowledge on the preventive practices is important in preventing or delaying the onset of osteoporosis as well as in minimizing morbidity due to osteoporosis. In this regards, a good knowledge about preventive measures for osteoporosis was observed in this study with regards to eating diet rich in calcium and regular exercise, in addition to smoking cessation. This was in contrast with Hossien et al.2014 (13) who concluded that defective knowledge about preventive measures for osteoporosis was observed with regards to eating diet rich in calcium and vitamin D and limiting the intake of tea and coffee. This was in agreement with Cadarette et al. 2007 (18) who reported significant knowledge deficit in the areas of osteoporosis consequences and prevention.

The current study showed that 97.3% of the responding participants considered that eating calcium rich food protect against osteoporosis. This was in accordance with Edmonds et al., 2012 (6) who claimed that all participants indicated agreement with statements of calcium intake as a protection toward osteoporosis. Furthermore, 24.3% of participants in the study of Wahba et al. 2012 (14) were consistent with this view. This is in contrast to the findings of Hossien et al. 2014 (13), who indicated that only 7.1% of the studied samples believed that calcium rich food is a preventive practice against osteoporosis.

Physical activities are necessary for increasing bone mass in all ages and thus perhaps reducing the risk of osteoporosis. In this regard, 88.5% of the studied subjects positively responded to the importance of regular exercise in preventing osteoporosis. This was in agreement with 94.6% of the participants in study done in Egypt by Hossien et al. 2014[13] and 59.1% in the study of Wahba et al. 2012.[14] However, the study by Tayel et al. 2013[11] had reported lesser percentage (34.7%).

About 67.3% of responding participants consider that smoking cessation is an important preventive behavior against osteoporosis, while only 3% of the respondents in the study done by Wahba et al. 2012 (14) were aware about this issue.

Calcium intake is vital for developing strong healthy teeth and bones. Recommended and sufficient intake of calcium is important in achieving optimal peak bone mass early in life and having increased bone mass in middle aged and elderly women. Moreover unhealthy or reduced dietary intake of calcium is linked to osteoporosis risk later in life. The present study showed

that only 6.5% of the responding participants identified the recommended amount of calcium intake for an adult per day as 800mg or more while 64.5% of them did not know the recommended daily amount of calcium for adults. Similar results were obtained by Edmonds et al. 2012[6] who found that only 11% of the respondents recognized the correct amount of calcium needed by adults as 800 mg or more a day. Furthermore, a study by Ford et al., 2011[19] reported that only 9.3% of US students and 10.5% of the Chinese students were able to identify 800 mg or more daily as the correct answer that Calcium intake and eating habits is one of the important measures in osteoporosis preventive practice.

About drinking milk daily, only 23.3% of our students drink milk daily; 50% of them drink it three or four times / week.

Regarding eating Green leafy vegetables, less than half (45%), and (21.8%) of the studied subjects ate Green leafy vegetables daily and three and four times / week, respectively. Fifty two percent and 49.8% of students rarely eat Cabbage / broccoli and tuna respectively, while 9.8% and 16.3% of them eat Cabbage / broccoli and tuna three or four times / week. Regarding Legumes, only 8.5% of them eat it daily while more than half (56%) rarely consume legumes.

Therefore; this survey showed that the majority of students are infrequent consumers of calcium rich food. This is in agreement with those reported by El-Sayed and Megeid., 2013[10], who concluded that their respondents had infrequent consumption of food rich in calcium and phosphorus as well as food rich in vitamin D. Another study in Sri Lanka by Silva et al., 2014[7] concluded that only 18.8% of the participants achieved the recommended daily dose (RDA) for Calcium. Despite being motivated towards taking calcium rich food, the mean calcium intake in The Sri Lanka study population was 528 mg/day. This was in agreement with those reported by Rafraf et al., 2009[17], who indicated that most interviewed women (50.4%) had daily calcium intake of less than 60% of the recommended level and calcium or vitamin D supplements were not consumed by majority of subjects, thus increasing the risk of osteoporosis. Similarly, non-adequate calcium intake in women has been reported by Liew et al., 2002.[20]

The present study offered the opportunity to compare the osteoporosis knowledge among medical students, and non-medical students. Our results showed that, overall, medical student scored significantly higher ($p < 0.001$) than non-medical students on general knowledge of osteoporosis . The same pattern of results was observed when percentage of answers of each of the questions among MS and NS were analyzed using $\chi 2$ test. For example, on the question related to the correct definition of osteoporosis, 58% of medical students provided the right answers compared to 33% of NS ($p < 0.001$). Moreover, 84.5% of medical students knew future osteoporosis risks compared to 65.5% of NS ($p < 0.001$). Our results indicated also that there was no significant differences between medical and non-medical students regarding their knowledge on osteoporosis signs and symptoms.

This study showed that concerning the awareness of osteoporosis risk factors, the medical students scored significantly higher than the non-medical students ($p < 0.001$). Analysis of responses to each question showed that 68% of the medical students believed that being a female is a risk factor for osteoporosis, and this was much higher than that of non-medical students (44.5%) ($p < 0.001$). Furthermore, 78% of MS considered positive family history is osteoporosis risk factor while only 57% of non-medical students did so ($p < 0.001$). In addition, 69% of medical students were aware of the fact that early menopause is one of osteoporosis risk factors, compared to 43.5% of non-medical students ($p < 0.001$). Moreover, 95% of MS knew that advanced age is an osteoporosis predisposing risk factor while 84.5% of non-medical students did so ($p < 0.001$). According to the knowledge on osteoporosis preventive behaviors, our result showed that there were no significant difference between medical and non-medical students.

Although our results indicate that medical students have good knowledge about osteoporosis concerning risk factors and preventive behaviors, this knowledge was not translated to appropriate changes in healthy life habits as it was shown that only 8.5% of medical students identified the recommended amount of calcium intake for an adult per day as 800mg, while 58% didn't know the recommended amount of calcium for adults. Also, the majority of medical students are infrequently consuming food rich in calcium, so that osteoporosis knowledge is not well clear among studied students.

CONCLUSION

The majority of our students were aware of osteoporosis general knowledge, signs /symptoms, risk factors and preventive behavior; yet there is a gap in the knowledge on some points, like the recommended amount of calcium intake for an adult per day. Moreover, our study showed that medical students were better than non-medical in terms of osteoporosis general knowledge, signs /symptoms, risk factors and preventive behavior. This difference can be explained by the fact that medical students can get more information about osteoporosis than other students or public as shown in our results as doctors were the main source of osteoporosis knowledge for medical students.

RECOMMENDATIONS

The existing results can be used to develop educational and programs that will help to raise awareness, knowledge and beliefs of university students and other people towards osteoporosis especially adequate calcium intake and healthy dietary intake of nutrients related to bone health.

LIMITATIONS

The survey was conducted in a single university, Ajman University of science & technology, and this limits the generalization and statistical comparison.

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CONFLICT OF INTERESTS

The authors declares that there is no conflict of interests.

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