Educational Intervention regarding Osteoporosis Knowledge among Nurses: A Comparative Cross-Sectional Survey

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Abstract

Summary

We observed a positive relationship between awareness and educational intervention based on the facts on osteoporosis quiz. There are notable gaps in current nursing knowledge, particularly in terms of preventative strategies.

Purpose/Introduction

Osteoporosis is one of the main public health concerns and informative health intervention remains important in management of osteoporosis due to modifiable risk factors through non pharmacological approach. The purpose of the survey was to evaluate the awareness and intervention effect on knowledge regarding osteoporosis among nursing professionals.

Methods

The design of the research investigation was comparative cross-sectional. The Systematic technique was selected for data sampling from 278 nurses using roasoft. Facts on osteoporosis quiz was used for data collection before and after intervention. Health information brochure was used for educating nurses regarding osteoporosis.

Results

The response rate was 100 percent as all the 278 questionnaires were received back from respondents. Osteoporosis affects both genders was correctly identified by 70.9% nurses before intervention and 82.4% nurses after intervention. There is a weak relationship between bone health ($r = 0.35, p = 0.000$) strong association between risk factors ($r = 0.70, p = 0.000$) and treatment and prevention ($r = 0.89, p = 0.000$). Significant differences were observed by applying paired t-test statistics.

Conclusions

The findings of the survey concluded a statistically significant association between knowledge and educational intervention. There should be improved teaching in nurses' syllabi in addition to ongoing nursing instruction programs such as seminars and workshops as deficiency of responsiveness related to osteoporosis was a barrier to adequate patient care.

Introduction

Osteoporosis is a significant public health threat globally with an assessed prevalence of more than 200 million[1].Osteoporosis is among the common causes of deaths and disability in old age men and post-menopausal women. Osteoporosis is an abnormal health condition wherein skeletal bones become porous and fragile because of tissue shrinkage correlated with risk factors[2]. The bone loss progress silently in early stages and is usually asymptomatic[3]. Osteoporosis once developed in the bones, patients have symptoms of pain in back that is due to collapsed vertebral column or fracture, shorted height with increasing age, posture that look like stooped and rapid bone fracture[4]. Thus, osteoporosis affects the whole skeleton, but wrist bone, ribs bone, hips bone and spine bone are more likely to be injured. Cracking and collapsing are the two common forms of fractures associated with osteoporosis [5]. Hip fractures are in cracked form and compression of spine vertebrae is by collapsing.

Etiology of the disease is linked with less or no calcium and vitamin-D intake, women with menopause before age of forty-five years or abnormal menstrual cycle, chronic alcohol users and smoking habits, less physically active, long term use of certain medications including corticosteroids[6–8]). Osteoporosis can be prevented through lifestyle modifications that include exercise, ideal body weight, moderate alcohol intake, smoking cessation and adequate consumption of vitamin D and calcium [9, 10]. The factors that cannot be modified include age, female gender, positive family history for the disease, hormonal imbalance and thin and small body frame[3]. Treatment guidelines are available at international and national level but there is a gap in real practice. Healthy lifestyle with diet modification must be adopted to recover from disease as well as to attain life quality [11]. Timely diagnosis in osteoporosis can minimize the risk of fracture in patients and financial burden on the health delivery system.

Osteoporosis had affected 9.90 million individuals in the Islamic republic of Pakistan with 7.19 million females[12]. Incidence of osteoporosis in the Islamic republic of Pakistan is estimated towards rise in coming years with an expected prevalence of 11.3 million in 2020 and 12.91 million in 2050[13]. Osteoporosis management will be of standard because of the up to date knowledge of the health care professionals. Knowledge of the nurses regarding osteoporosis might progress the degree of responsiveness to the treatment and prevention in people with osteoporosis[14]. Low compliance of patients is linked with lack of knowledge of health care professionals. The educational activities can overcome the real gap between standard treatment and current practices[15].

Nurses are the direct and frontline health care professionals who have generally open probabilities to communicate with patients and their attendants. Nursing professionals are accurate choices to communicate osteoporosis preventive health education to patients as well as general peoples but few research investigations at international level are present regarding the awareness of the nursing professionals for osteoporosis[16]. International investigations have noticed the lack of knowledge regarding etiological causes and preventive measures of osteoporosis among nurses [16–18].One of the effective methods in public health for health promotion and disease prevention is enabling health care professionals with health literacy. Chronic illnesses such as osteoporosis with modifiable risk factors need prevention by health education programs. The informative health intervention remains important in

management of osteoporosis due to modifiable risk factors through non pharmacological approach[19]. The capacity of health education in improving patient adherence to osteoporosis therapy is commendable. Thus, educating nurses with improved knowledge as a healthcare professional might be essential component. Research investigations in past had proven the impact of interventions in increased knowledge about osteoporosis[20]. Patient care therefore needs improvement by educational interventions. Deficiency of investigation at Pakistan institute of medical sciences motivated the researchers for this survey. The rationale of this survey was to evaluate the effect of an instructive involvement regarding osteoporosis awareness among nurses in a tertiary care teaching hospital in Islamabad. A positive association was hypothesised between osteoporosis awareness and educational intervention.

Methods

Survey design and Sampling technique

The survey designed was comparative cross sectional. The research approach adopted was quantitative. The technique of sampling utilized in survey for data collection was systematic sampling. Cross sectional data set was obtained twice for the current survey by using a comprehensive questionnaire before and after intervention.

Survey area and Sample size

The survey was conducted at the Pakistan Institute of Medical Sciences (PIMS), in the federal capital city Islamabad. The populace consisted of male and female nurses working in the teaching health care facility. The sample size was calculated by using online software 'Roasoft' with known population of nurses of N=1000 in the teaching health care facility. The margin error was 5%, at 95% of level of confidence, and distribution of response was 50%. The size estimation of sample was turned out to be 278. All nursing professionals agreed for participation were included in the survey. On long leave and refuse to participate was excluded from the study.

Modified Facts on Osteoporosis Quiz and Health education model

A validated questionnaire was used as tool for survey data after the permission from the author[18] before and after intervention. Health education model was used for educating nurses with the help of brochure regarding osteoporosis. The brochure comprised of material associated with bone health, risk factors, treatment options and precautionary measures. Sampled population were interacted at the nursing stations and lecture rooms. Nursing professionals who provided inclination for survey participation furnished written informed consent. The educational intrusion took almost 30 minutes for filling of pre and post intervention survey with interpretation of health information brochure by the nurses.

Data Collection and Analysis

The survey was grounded on a well-organized validated tool. Pilot study on ten nursing professionals helped in the modification of the tool. The investigation was performed during October-November 2019. The statistical investigation involved the use of statistical package for social sciences 21 version for analysis. Descriptive analysis involved computation of percentages and frequencies while paired-t-test and chi square test was applied to observe the association between variables before and after intervention. The choice of variables used in survey is grounded on the earlier comparable investigations globally. The subscale set of variables connected to bone health, risk factors, treatment and prevention was computed for applying inferential statistics.

Ethical Approval

The present survey was permitted by the institutional review board and advance studies and research board of the Shaheed Zulafiqar Ali Bhutto Medical University via notification No.F.2-11/SZABMU/AS&RB)-62/2019. The aim of the investigation was demonstrated to the sampled population before the questionnaires were administered and written informed consent was obtained. Respondents were informed about the ethics and right of voluntary participation. The respondents were guaranteed confidentiality and anonymity of their responses to the publication.

Results

Participant’s sociodemographic

The response rate was 100 percent as all the 278 questionnaires were received back from participants. About gender classification about 89.6 % of the participants were female and 11.4 % were male. Majority of the respondents were in middle age i.e. 57.6%, followed by older adults (22.7%) in addition to young age (19.8%), respectively. The educational level comprised of 66.5% diploma holders and 33.5% post RN BSN professionals.

Pre-intervention and post intervention knowledge of nurses regarding osteoporosis

The research investigation involves filling of pre and post intervention questionnaire and reading of health information brochure by the nurses. Majority of the respondents answered correctly before intervention and after the educational intervention the correct response rate increased significantly. The results are presented in table 1

Table 1: Pre-intervention and Post-intervention Knowledge of Nurses regarding Osteoporosis

Variable (correct response)	Pre-Intervention Correct response n=278		Post-Intervention Correct response n=278	
	Frequency	Percentage	Frequency	Percentage
Bone health				
High-impact exercise improves bone health(true)	218	78.4%	226	81.3%
Bone health significantly improved by walking (false)	81	29.1%	115	41.4%
Bone strength building time is between age of nine to seventeen years (true)	218	78.4%	252	90.6%
Bone mass is gained by majority of the population after thirty years of age (false)	131	47.1%	234	84.2%
Risk factors				
Both genders are equally affected by osteoporosis (true)	197	70.9%	229	82.4%
Alcohol intake is not associated with osteoporosis occurrence (false)	131	52.9%	224	80.6%
Osteoporosis risk increases with low intake of calcium in combination with high intake of caffeine (true)	203	73%	211	75.9%
Osteoporosis risk does not increase with low intake of vitamin D and calcium during lifetime (false)	131	47.1%	168	60.4%
The risk of osteoporosis increases with physical activity (False)	131	47.1%	254	91.4%
Osteoporosis risk does not increase with smoking (false)	106	38.1%	114	41%
Menopause afterwards bone loss progress rapidly(true)	218	78.4%	261	93.5
Females with low weight have more chances of osteoporosis than heavy weight (true)	218	78.4%	256	92.1%
Osteoporosis risk is not among females with premature menopause (false)	79	28.4%	242	87.1%

Positive family history is not a contributor for osteoporosis (false)	131	47.1%	208	74.8%
Treatment and prevention				
Therapy is available after the development of osteoporosis(true)	197	70.9%	227	81.7%
Osteoporosis is prevented by many ways (true)	149	53.6%	200	71.9%
Lack of prevention will lead to osteoporosis associated fracture among 20% of females older than fifty years of age(true)	159	57.2%	174	62.6%
Hormone replacement therapy in females after menopause cannot delay bone loss (false)	131	47.1%	182	65.5%
Prevention of osteoporosis is achieved by intake of 1 glass of milk in children of age 9 to 17 years (false)	81	29.1%	205	73.7%
Menopause afterwards, females without estrogen therapy needs about 1500 mg dose of calcium (equivalent to five glasses of milk) on daily basis (true)	197	70.9 %	202	72.7%

Correlation and Paired-t-test

Correlation was applied to observe the relationship between variables. There is a weak relationship between bone health ($R=0.35$, $P= <0.01$) strong association between risk factors ($R=0.70$, $P= <0.01$) and treatment and prevention ($R=0.89$, $P= <0.01$). The effect of intervention on osteoporosis awareness among nurses was evaluated by using paired t-test statistics. Significant differences were observed between all the paired variables as represented in table 2.

Table 2: Application of correlation and paired t test before and after intervention

<i>Variables</i>	<i>Intervention</i>	<i>Mean</i>	<i>SD</i>	<i>Mean difference</i>	<i>Correlation r-value</i>	<i>p-value</i>	<i>t-value df (277)</i>	<i>p-value</i>
Bone Health	Before	5.14	1.32	0.38	0.35	<0.01*	5.07	<0.01*
	After	5.53	0.78					
Risk Factors	Before	13.4	3.40	1.42	0.70	<0.01*	9.09	<0.01*
	After	14.9	1.42					
Treatment & Prevention	Before	8.2	2.04	0.26	0.89	<0.01*	4.88	<0.01*
	After	8.5	1.72					

Note: * indicates the significance level at 0.05.

Effect of Age, gender and education on awareness of osteoporosis before and after intervention

The influence of age, gender and education was observed by applying chi-square statistics. The findings of the chi-square test indicated that bone health awareness and risk factors of osteoporosis variables before intervention, treatment and prevention variables after intervention were significant with respect to the education. There was no difference in knowledge with respect to age. The variable treatment and prevention after intervention was only significant with respect to gender. The results are represented in table 3.

Table 3: Relationship between socio-demographic characteristic and awareness related to osteoporosis

Sociodemographic Variable	Response	Before intervention		p-value	After intervention		p-value
Bone health awareness							
Age							
15-29 years	No	76.4%	0.38	0.82	43.6%	3.10	0.21
	Yes	23.6%			56.4%		
30-44 years	No	78.1%			51.9%		
	Yes	21.9%			48.1%		
45-59 years	No	81.0%			39.7%		
	Yes	19.0%			60.3%		
Gender							
Male	No	69%	1.70	0.19	44.8%	0.09	0.76
	Yes	31%			55.2%		
Female	No	79.5%			47.8%		
	Yes	20.5%			52.2%		
Education							
Diploma	No	74.1%	6.22	0.01*	47.6%	0.00	0.96
	Yes	25.9%			52.4%		
Post RN BSN	No	87.1%			47.3%		
	Yes	12.9%			52.7%		
Risk Factors							
Age							
15-29 years	No	47.3%	0.08	0.95	45.5%	1.93	0.37
	Yes	52.7%			54.5%		
30-44 years	No	45.0%			41.3%		
	Yes	55.0%			58.7%		
45-59 years	No	46.0%			33.3%		
	Yes	54.0%			66.7%		
Gender							

Male	No	37.9%	0.78	0.37	48.3%	0.85	0.35
	Yes	62.1%			51.7%		
Female	No	46.6%			39.4%		
	Yes	53.4%			60.6%		
Education							
Diploma	No	40.5%	5.89	0.01*	41.1%	0.14	0.70
	Yes	59.5%			58.9%		
Post RN BSN	No	55.9%			38.7%		
	Yes	44.1%			61.3%		
Treatment & Prevention							
Age							
15-29 years	No	61.8%	0.54	0.76	65.5%	0.85	0.65
	Yes	38.2%			34.5%		
30-44 years	No	56.9%			66.9%		
	Yes	43.11%			33.1%		
45-59 years	No	55.6%			60.3%		
	Yes	44.4%			39.7%		
Gender							
Male	No	58.6%	0.01	0.90	44.8%	5.86	0.01*
	Yes	41.4%			55.2%		
Female	No	57.4%			67.5%		
	Yes	42.6%			32.5%		
Education							
Diploma	No	55.7%	0.79	0.37	61.1%	3.94	0.04*
	Yes	44.3%			38.9%		
Post RN BSN	No	61.3%			73.1%		
	Yes	38.7%			26.9%		

Note: * indicates the significance level at 0.05.

Discussion

Nurses are the largest professionals in health care globally [21]. Nurses have a vital duty to communicate health education to sick individuals and general public. Their up-to-date familiarity is prerequisite for improved health literacy in the health care system [22]. As per sex ratio, women were more (89.6%) in the current investigation as compared to male nurses. Similar results were reported in studies in Pakistan that female health care professionals were more in number than male [23, 24]. Life course risk of osteoporosis related fracture is between 40-50% in females in comparison of 13-22% in males [25]. Osteoporosis affects both genders was appropriately recognized by majority of the contributors in the present survey.

Physically active individuals had low osteoporosis risk as movement prevents the disease progress and improves skeletal strength [26]. The awareness was in less than 50% of the nursing professionals before health promotion brochure and 91.4% answered correctly after reading brochure. Gym and other weight lifting exercises resulted in bone health improvement [27]. The response regarding physical training was almost similar (>78%) in pre and post investigation. Walking has a noticeable cardiac benefit but insignificant indication for proposal of a valuable effect on healthy bones. The incorrect statement that bone health significantly improved by walking was correctly responded by less than half of the sampled population. Similar results were reported in India among nurses by Dwidmuthé and co-investigators [28]. Knowledge of bone development is imperative for osteoporosis management. Most individuals get their ultimate bone mass around 25 to 30 years of age [25]. The false inquiry related to bone mass development after thirty years of age in majority of the populace is acceptably identified by 47.1% participants before intervention and 84.2% participants after intervention. The ideal period to build bone density is in rapid development years [29]. Therefore, the most significant age period of nine to seventeen years for building bone strength is accurately replied by 78.4% nurses before intervention. Educational intrusion caused a significant improvement in answer of 90.6% after intervention.

Osteoporosis is among the common causes of deaths and disability in old age men and post-menopausal women [30]. Females afterwards menopause are considered more susceptible to loss of bones as compared to males because of less estrogen production in their body [31]. Women's afterwards menopause five to seven years will lose density of bones up to twenty percent. The research question that normally, bone loss speeds up after menopause was correctly identified by 78.4% participants before intervention and 93.5% participants after intervention. Premature menopause is a risk contributor for osteoporosis in females. The 28.4% of the nurses knew that before intervention and 87.1% replied correctly after intervention.

Osteoporosis can be prevented through lifestyle modifications that include exercise, moderate alcohol consumption, smoking termination and adequate ingestion of calcium supplements and vitamin D [31]. The risks that cannot be modified include age, female gender, positive family history for the disease, hormonal imbalance and thin and small body frame. The 53.6% respondents replied that Osteoporosis is prevented by many ways and after intervention education level increased significantly (71.9%). The statement "Lack of prevention will lead to osteoporosis associated fracture among 20% of females older than fifty years of age" was known to 57.2% of the nurses before and 62.6% of the nurses after

educational activity respectively. Growing age children would need high calcium intake and just one glass of milk will not be enough for preventing osteoporosis. This research question was correctly responded by 29.1% before and 73.7% after intervention. Females not on estrogen therapy after menopause need diet modification of 1500 mg of calcium that is equal to daily intake of five glasses of milk. This statement is correctly opinioned by 70.9% before and 72.7% after intervention. The replacement of hormones afterwards menopause cannot delay bone loss was false statement was identified by 47.1% nurses before and 65.5% nurses after intervention. The correct preventive response rates were less than reported in Singapore among nurses using the same tool[18].

A small ingestion of vitamin D and calcium during life course does not rise the risk of osteoporosis was responded by 47.1% before and 60.4% after intervention. The use of caffeine enriched foods in higher amount and little ingestion of calcium in diet increases the osteoporosis risk. There is no noteworthy change (2.9%) in statistics of respondents after educational activity. Cigarette smokers are at enlarged threat of osteoporosis fractures was correctly identified by 41% of the participants even after educational activity. The results reported related to risk factors were dissimilar from osteoporosis survey in Korea where majority of the nurses were aware of risk contribution of smoking, excessive use of caffeine and low intake of calcium and vitamin D supplements. Lesser weight females have osteoporosis more than obese females was correctly answered by majority of the nurses in Pakistan in contrast to Korea[16]. Osteoporotic fracture chances increased by 40 % with excessive alcohol consumption due to antagonistic effects on bone-forming cells. Therefore, the statement "Alcohol intake is not associated with osteoporosis occurrence" was wrong was acceptably recognized by 47.1% of the nursing professionals before intervention and 80.6% of the nurses after intervention. A positive history of fracture among parents is linked with increased risk of fracture especially hip fracture. Family positive history for osteoporosis remained not a risk contributor was identified correctly as false by 47.1% of the nurses before and 74.8% of the nurses after intervention. After the progression of osteoporosis disease therapy choices are offered were known to 70.9% of the nursing staff before intervention and 81.7% of the nursing staff after intervention. These results were similar as reported by Park *et al* in Korea [16].

Strength

The research study design has root out many ideas which were the key elements for investigating the knowledge of osteoporosis among nurses by educational intervention.

Limitations

The targeted health intervention was brochure based because of unavailability of time of respondents for seminar or workshop.

Conclusion

The outcomes of this research investigation specified that the awareness of osteoporosis amongst nursing experts in Pakistan needs improvement through educational intervention. The findings of the

survey concluded a positive statistically noteworthy relationship between awareness and educational intervention. There are notable gaps in the prevailing information among nurses especially in preventive measures. This pioneer educational intervention among nurses shed light on the ignored feature of health care teaching and encourage measures to address these gaps in awareness.

Keeping in view the scarcity of research study in osteoporosis knowledge among nurses the present study was conducted. However, alike survey may be suggested particularly in private health care facilities. Research in osteoporosis may feasibly be allotted topmost importance so that all stake holders should pay attention.

The subject of osteoporosis management and treatment might be covered in health-related field's syllabi as integral part of curricula. Nurses demonstrates several roles as instructor, patient counselor so they should take professional obligation in initial rehabilitation and prevention of ailment. There should be improved teaching in nurses' syllabi in addition to ongoing nursing instruction programs such as seminars and workshops as deficiency of responsiveness related to osteoporosis was posed an obstacle to adequate patient care.

Declarations

Funding

This research did not receive any specific grant from funding agencies in the public or private sectors.

Conflict of Interest

Khair-Un-Nisa, Atta Ur Rehman and Ume Hani declare that they have no conflict of interest

Availability of Data and material

The data that supports the findings of this study are available from the corresponding author upon reasonable request.

Ethics Approval

The present survey was permitted by the institutional review board and advance studies and research board of the Shaheed Zulfikar Ali Bhutto Medical University via notification No.F.2-11/SZABMU/AS&RB)-62/2019. The aim of the investigation was demonstrated to the sampled population before the questionnaires were administered and written informed consent was obtained. Respondents were informed about the ethics and right of voluntary participation. The respondents were guaranteed confidentiality and anonymity of their responses to the publication.

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