

---

*Original Research Article***A REVIEW OF KNOWLEDGE, ATTITUDE AND PRACTICES (KAP) OF COMMUNITY POPULATION TOWARDS OSTEOPOROSIS****\*<sup>1</sup>Yusra Habib Khan, <sup>1</sup>AzmiSarriff, <sup>1</sup>Amer Hayat Khan**

School of Pharmaceutical Sciences, University Sains Malaysia (USM). Pulau Penang 11800 Malaysia.

**ABSTRACT**

Osteoporosis remains a major global public health concern. A good knowledge and awareness of a disease are pre-requisites for success of preventive measures, modifications in life styles and treatment adherence. Previously, various studies to evaluate knowledge of osteoporosis in different populations have been conducted. Most of these studies assumed that as knowledge regarding a disease increases, attitudes and practices of preventive measures towards that disease change positively. Aim of the article is to review all published articles based on knowledge assessment in different community population and to correlate level of knowledge with significant demographic factors as well as practice of preventive behaviors. The most significant factor that showed direct relation with knowledge of osteoporosis was level of education while most of the studies revealed a weak association between knowledge of osteoporosis and practice of preventive behaviors. In order to evaluate knowledge and practices regarding osteoporosis, a single validated questionnaire should be developed by well-established organizations working for osteoporosis. Secondly factors, other than knowledge, that could affect attitude and practices should be figured out. Focusing on those factors, appropriate multidisciplinary programs to enhance knowledge of osteoporosis in different community populations should be developed.

**Keywords:** Awareness, Attitude, Community, Knowledge, Osteoporosis, Practice

---

**Corresponding Author:** Yusra Habib Khan, Department of Clinical Pharmacy, School of Pharmaceutical Sciences, University Sains Malaysia, Palau Penang, Malaysia. Postal code 11800 H/P: 016-4764150, E. mail: yusrahabib@ymail.com**INTRODUCTION:**

Osteoporosis is a silent disease that is becoming a major global public health concern. [1]. The disease not only causes increase economic burden, it also leads to social, physical and psychological consequences. The incidence of osteoporosis has been increasing particularly due to increase in life expectancy of general population. [1, 2]. Although osteoporosis can affect either gender, 80% of those affected are women. [3]. A conservative estimate suggests that every four women over age of 50 years suffer from osteoporosis. Moreover, each year more women die due to osteoporosis as compare to the combined death rate of both breast and ovarian cancer. [4] Despite of availability of therapies for treatment of osteoporosis, prevention is still preferable to combat disease. [5] In order to plan for increase awareness and prevention of osteoporosis, information regarding health beliefs and knowledge of osteoporosis in general population is necessary so that adequate strategies can be formulated accordingly. [6,7,8].

## MARTIAL AND METHODS

### Search strategy:

A literature search was undertaken to review the studies that demonstrate knowledge, health beliefs and practices towards osteoporosis in general population. Science Direct, Google Scholar, Springerlink & Ebscohost were used as search engines to identify relevant literature. Both free text and MeSH headings comprising key words like knowledge/ awareness, osteoporosis, evaluation, community, general population, KAP etc. were used as research strategy. This produced a list of more than 750 articles. These articles were then individually screened for relevancy according to inclusion criteria. Efforts were made to find full text of all references that appeared relevant, even then a few papers were unable to access.

The search strategy focused on cross-sectional and cohort studies. Studies utilizing population based surveys were also included.

### Inclusion criteria:

Studies that evaluate knowledge & health beliefs of osteoporosis in different community populations and were published from 2000 and onward in English language were included. Due to large number of studies, research studies that have been published since 2007 (five year review) are only summarized in Table 1. Studies which do not provide data on evaluation of knowledge and health beliefs of osteoporosis were excluded.

### Quality assessment:

Because of varied nature of studies, there are no accepted appropriate criteria for quality assessment of studies included in this review but specific aspects of quality were considered potentially important. Therefore, these aspects were extracted and summarized for each study. These included study population characteristics, study location, sample size, methodology used and quantitative interpretation of study results.

**Table 1: Studies showing KAP towards Osteoporosis**

Von Hurst & Wham(2007)	622 women Mean age:32.6 years  Auckland, New Zealand	Self-administered internet based questionnaire	<ul style="list-style-type: none"> <li>• Mean knowledge score 63%, with young ones scoring less</li> <li>• &gt;2/3 participants did not consider themselves susceptible to OP</li> <li>• Only 22.5% could identify OP as a crippling disease</li> </ul>	Public health messages about awareness and prevention of OP should be implemented	All persons can't have access to internet, so it may result in biased results
Sally & Jane (2007)	224 (16-18 years old) students  4 state and 3 private schools in Bedfordshire, England	Self-administered questionnaire that has been prior tested for validity and reliability	<ul style="list-style-type: none"> <li>• Response rate 81%</li> <li>• 1/3 of subjects have not heard about osteoporosis</li> <li>• 73% male &amp; 52% female rated low likelihood of</li> </ul>	Low level of knowledge regarding prevalence and risk factors of disease	Small sample size, results cannot be generalized  Random sampling

			<p>developing osteoporosis</p> <ul style="list-style-type: none"> <li>• 60% male &amp; 62% female rated person's responsibility of developing osteoporosis low</li> <li>• 50% females were unable to recognize relationship between menstruation, menopause and osteoporosis</li> </ul>	Targeted education programs are needed for this age group	from larger population may improve study design
Pauline et al. (2008)	<p>88 women being osteoporotic &amp; postmenopausal with mean age 66.8±7.4 years</p> <p>43 pharmacists</p> <p>Osteoporosis clinic, UMMC, Kuala Lumpur, Malaysia.</p>	MOKT previously tested for validity & reliability was given to patients	<ul style="list-style-type: none"> <li>• Response rate 94 %,5 women were dropped as they did not meet inclusion criteria</li> <li>• Patients knowledge was good on the use of medications (mean score ± S.D. = 87.1 ± 12.7%)</li> <li>• Patients' knowledge was lowest on the risk factors (mean ± S.D. of 60.6 ± 24.0%)</li> </ul>	Patient group showed a mean score of ± SD of 69.0±13.9 while pharmacists showed a mean score of 81.6 ± 9.5	<p>Small sample size, results cannot be generalized</p> <p>MOKT used was in English language, being multi racism in Malaysia all people cannot understand English.</p>
Krystallenia et al.(2008)	<p>99 women (aged: 61.59 ± 9.61 years)</p> <p>20 pharmacies in Athens</p>	<p>Pilot study</p> <p>Administration of self- design questionnaire by pharmacists</p>	<ul style="list-style-type: none"> <li>• Response rate 53.5%</li> <li>• 96% knew definition of osteoporosis</li> <li>• 47.5% participants were aware of at least one risk factor</li> <li>• 86.3% reported physicians as their source of information while 20% reported media</li> <li>• Maximum participants identified reduced milk consumption (78.7%) and absence of physical activity(55.4%) as risk factor</li> <li>• Least identified risk factors were smoking (19.1%) and family history (12.8%)</li> </ul>	<p>Low level of knowledge among patients greater than 60 years old</p> <p>Level of awareness increases with level of education</p> <p>Large studies should be conducted to increase awareness in target population</p>	<p>Small sample size</p> <p>Only patients on treatment of osteoporosis were included so results cannot be generalized</p> <p>Questionnaire used was not validated</p>
Mehmood et al.(2008)	<p>269 healthy women with age group: 25-35 years, 36-</p>	<p>Face to face interview to deliver 20 item OKAT</p>	<ul style="list-style-type: none"> <li>• Cross sectional study (6 months)</li> <li>• Response rate 94%</li> <li>• Mean score on OKAT</li> </ul>	Irrespective of age, higher socioeconomic status and	Face to face interview may lead to biased results

	45 years & over 45 years  Agha Khan hospital, Karachi, Pakistan	questionnaire	questionnaire was 11.04 ± 2.72  • Total score of osteoporosis knowledge in all 3 groups was same i.e. 9 (median) • In all three groups maximum score was obtained on symptoms and preventive risk factors • Least knowledge was reported by all 3 groups on treatment of osteoporosis	higher education level are positively associated with knowledge of osteoporosis  Education campaigns should be initiated to increase awareness.	
L.Abushaikha et el.(2009)	148 female school students Age: 16-18 years  Irbid, Jordan	Administration of self –design 12 item questionnaire	<ul style="list-style-type: none"> <li>• Mean score 24.1/54</li> <li>• Maximum 80% identified fracture as a risk factor for OP while least 16% were able to identify preventive strategies for OP</li> <li>• Correct sources for calcium and vitamin D were identified by 50% of sample</li> </ul>	Educational programs for young girls and women should be established to increase awareness	Questionnaire used was not validated
Swan Sim et al.(2010)	338 females, 139 male, 6 did not state their sex Mean age 50.15 ± 14.6 years Selected public related health forums, 3 cities in Malaysia	Administration of self- design questionnaire	<ul style="list-style-type: none"> <li>• Cross sectional study( 6 months)</li> <li>• Response rate 80.5 %</li> <li>• 87.1% of the respondents had heard of OP i.e. 89.6% women compare to 81.0% men</li> <li>• 89.5% of the respondents were concerned about getting OP 55.7% obtained information from newspapers while least information 11.4% was obtained by internet</li> </ul>	Women with better education and higher income have more knowledge on O  Public health messages for prevention of osteoporosis should be implemented.	Questionnaire used was not validated.  As study population was attending health forums, they would have more knowledge.
Patil et al. (2010)	243 women > 40 years Mean age: 56.7 SD ± 12.6  Urban health center, Mumbai, India	20 item self- design questionnaire with prior validation and reliability  Questionnaire	<ul style="list-style-type: none"> <li>• Cross sectional study( 8 months)</li> <li>• Maximum 55% identified electronic media as their source of information while only 20% identified physicians as their</li> </ul>	lack of knowledge about osteoporosis in the present sample  Literate	Study population was from outpatient department, results cannot be generalized to

		was available in English and 2 local languages	source <ul style="list-style-type: none"> <li>• 51.4% identified OP as condition of fragile bones</li> <li>• Maximum score was obtained on risk factors while minimum score was obtained on awareness of HRT and consequences of OP</li> </ul>	women have better knowledge on OP as compare to illiterate	population residing in that area
Monsanto HA (2010)	342 women Age:50 years & older  Puerto Rico	Telephone interviews	<ul style="list-style-type: none"> <li>• One in ten women did not know about risk factors that lead to OP</li> <li>• One in five women did not know about complications of OS</li> </ul>	Public education campaigns addressing risk factors and preventive measures should be initiated	Reliability of telephonic interviews is questionable
Maratib et al. (2011)	246 women over 40 years old Outpatient department of Civil Hospital Karachi, Pakistan	Self-administered questionnaire in local language  Cross sectional study( 6 months)	<ul style="list-style-type: none"> <li>• 43.5% women have heard about osteoporosis</li> <li>• 56.9% women identified fractures as consequence of osteoporosis</li> <li>• Less than 50% women use milk &amp; fish in diet</li> <li>• 45.1% women reported to take adequate sunlight</li> </ul>	Poor knowledge of osteoporosis among literate women  Preventive strategies are not being followed	Questionnaire used was not validated
Nguyen et al. 2011	217 women Age: 13 to 76 years  Da Nang, Vietnam	Administration of 30 item questionnaire to women attending health care facilities	<ul style="list-style-type: none"> <li>• Cross sectional study(2 months)</li> <li>• 81.6% of the women had heard of OP</li> <li>• Mean score : 14.71 ± 5.2</li> <li>• On average, sample answered 49% of the questions correctly</li> <li>• 90% of the women expressed interest in a prevention and treatment program</li> </ul>	Women with higher education and those having family member suffering from OP showed better knowledge.	Small sample size Sample already attending health care facility so they might have better knowledge
Lucia costa et al.(2011)	232 postmenopausal women with osteopenia or osteoporosis	Cross sectional study  Personnel interview at clinic site to	<ul style="list-style-type: none"> <li>• Average scores of correct answers; wrong answers and 'don't know' answers were 9.8, 6 &amp;4.1 respectively.</li> </ul>	Limited knowledge in women suffering from osteoporosis	Patients in study were already attending clinic so they might have

	Average age 61.6 years ( $\pm 8.2$ years) & average time since menopause 16.8 years.  Menopause Outpatient Clinic at Caism, Brazil	gather demographic & social data  Administration of 20 item questionnaire that focus on General information Risk factors Consequences Treatment	<ul style="list-style-type: none"> <li>• Average score for women with university degree 5.29 (<math>\pm 4.89</math>) while 1.72 (<math>\pm 3.69</math>) for women with incomplete school education</li> <li>• Maximum women (86.2) identified lack of exercise as risk factor for osteoporosis while age at which bones are strongest was identified by least women (67.2)</li> <li>• Maximum women (33.6) answered "don't know" about side effects of HRT (hormone replacement therapy)</li> </ul>	Knowledge of osteoporosis increases with level of education	more knowledge than general population
--	--	---	---	---	--

### Synthesis:

A statistical synthesis of all the studies included in this review was not considered appropriate. The reason being heterogeneity of the studies in terms of design, study location, methodology and interpretation of results. Instead, a narrative and tabular overview of studies is presented in current paper.

After systemic review of studies, mean knowledge score of each study population was analyzed to determine level of osteoporosis awareness in different study populations. Following this level of knowledge was associated with practice of preventive behaviors. Relationship between demographic factors e.g. age, level of education, gender etc. and knowledge of osteoporosis was assessed.

## RESULTS

Thirty studies that met the inclusion criteria of evaluating awareness of osteoporosis in community population were identified after literature review.

**Study location:** The studies in this review are from diverse geographical locations. Majority of studies are from Canada, South-East Asia, Middle East, USA and U.K while only one study from each country like Taiwan, New Zealand, Ireland, Brazil and Turkey.

**Methodology:** Most of the studies included in this review used a self-design questionnaire (with prior validity and reliability) for assessing knowledge of osteoporosis. Some studies evaluate knowledge by means of interviews either face to face [16, 17, 24]. or via telephone [28].

**Knowledge about osteoporosis:** Study population that had heard about osteoporosis varies significantly from one study to another. In majority of studies, greater than 70% of population had heard about osteoporosis [9,12,22,26]. While some studies have shown that less than 60% of population was aware with osteoporosis [23,25]. A complete unfamiliarity with the term osteoporosis was shown by small number of population in a few studies. [13, 20, 21]

**Attitude towards osteoporosis:** Individual's perceived susceptibility of suffering from osteoporosis was quite low in majority of studies [12, 13, 22] whereas a high susceptibility of becoming a victim of this disease was only shown by one study in this review. [26]The perceived low susceptibility of osteoporosis by community may be result of lack of perceived awareness of osteoporosis as a serious disease. [13, 16].

**Awareness on risk factors:** General lack of awareness on risk factors was identified by various studies.[19,21,28] Lack of exercise and low calcium intake were the risk factors that were identified by majority of study population[13,23,] while the least recognized risk factor was family history of osteoporosis i.e. genetics [23].

**Source of information:** Majority identified media followed by physicians as their source of information. [9, 11, 26, 27].

**Socio-demographic factors:** Studies have shown that knowledge of osteoporosis is significantly associated with level of education [10, 17, 24] and age. Some studies suggest that as age increases level of knowledge on osteoporosis increases[14, 19]while others contradict this and state that increase knowledge on osteoporosis is associated with younger age.[16,17,23].Two studies in this review included both men and women from community. Both studies concluded that as compare to men, women showed better knowledge and increased susceptibility towards osteoporosis. [11].

**Relationship between knowledge and practice:** In the past a relationship between knowledge of osteoporosis and practice of preventive behaviors has been established. However, most of the studies in this review showed a weak relationship between knowledge of a disease and practice of preventive measures. [12, 18, 29].

Three studies in this review recruited health care professionals.[19,22]The questionnaire used for assessing health care professionals knowledge differ from different questionnaires used for evaluating general population knowledge in following aspects: prevalence, Identification of bone mineral density ( BMD) and recommended daily amounts of calcium and vitamin D, diagnosis and treatment. Results showed general lack of awareness of osteoporosis in nurses. Only area in which maximum score was achieved was identification of preventive measures. [19] Compare to nurses, Pharmacists showed significantly high knowledge on all aspects of osteoporosis. [22].

## DISCUSSION

General awareness pertaining to osteoporosis knowledge, risk factors, preventive measures, personnel susceptibility and life style practices was evaluated in different community populations in this review.

Result of the present review showed that irrespective of age, level of education had a significant association with knowledge of osteoporosis. Women with high level of education were more aware about osteoporosis in all aspects, though a general lack of awareness with respect to risk factors was identified by majority of studies. Findings of the present review suggest that there is a weak relationship between knowledge, beliefs and practices regarding osteoporosis in general population. Although these results may be discouraging but can be expected.[6] Previously it has been suggested by various health models that although knowledge may be a necessary component of attitude and practices towards health but knowledge alone cannot result in behavioral changes.[32, 33]. In case of osteoporosis, various possibilities that explain the weak relationship of knowledge, attitude and practices have been figured out. These possibilities are asymptomatic nature of disease until adverse event occurs, perception of osteoporosis as an irreversible normal aging process, reluctance for bone scanning due to radiation and perceived health risks. Moreover, various cultural and religious beliefs that can effect individual's perception of disease and practice of preventive behaviors should also be figured out.

In order to cope up with the current state of unawareness among community population, health care professionals from all fields should acknowledge seriousness of disease and pay attention on possibilities that explain weak link between knowledge, attitude and practices. Such possibilities that explain lack of relationship between knowledge and practices should be evaluated and specific awareness should be initiated in this aspect. Three studies in this review recruited health care professionals.[19,22] The questionnaire used for assessing health care professionals knowledge differ from different questionnaires used for evaluating general population knowledge in following aspects: prevalence, Identification of bone mineral density ( BMD) and recommended daily amounts of calcium and vitamin D, diagnosis and treatment. Results showed general lack of awareness of osteoporosis in nurses. [19] Only area in which maximum score was achieved was identification of preventive measures. Compare to nurses, Pharmacists showed significantly high knowledge on all aspects of osteoporosis. [22]

The main limitation of current review, as with all reviews, is the potential for publication bias. Although efforts were made to identify all relevant recent studies but due to heterogeneity of studies it was not possible to include all of them. Other limitation is the quality of studies included. In most studies self-design questionnaires have been used. The reliability and validity of such questionnaires are questionable. Secondly, scoring system adopted to score good, fair or poor knowledge was not mentioned in majority of papers. A well explained scoring system is very important for ensuring uniformity of results in different studies. The quality of current review could be enhanced if all the studies utilized a standard questionnaire for evaluating knowledge perceptions.

## CONCLUSION

There is consistent evidence from number of studies, with different designs and diverse geographical areas, that there is lack of awareness regarding knowledge of osteoporosis in general population. All the studies included in this review concluded to intensify public education and health promotion campaigns to increase awareness in general population. The target of such campaigns should be all population irrespective of gender and age. As level of education is positively associated with knowledge of osteoporosis, importance of education

should be emphasized in all such campaigns. This review implies that health education in general population may result in avoidance of risk factors associated with osteoporosis. Enhancing awareness of osteoporosis should be a priority of future intervention programs in order to promote strategies that would ultimately result in prevention of osteoporosis. Further research should be carried out to evaluate the effect of such interventional programs on knowledge, attitudes and practices of community population.

#### **ACKNOWLEDGEMENT:**

I would like to express my greatest gratitude to my supervisor Dr. Azmi Sarriff and co-supervisor Dr. Amer Hayat Khan for their continuous support, ongoing advice and encouragement during writing of this review.

This article received no specific grant from any funding agency in the public, commercial or not-for-profit sector.

#### **REFERENCES:**

1. Williams B, Cullen L, Barlow JH. (2002) "I never realized how little I knew!" A pilot study of osteoporosis Knowledge, beliefs, and behaviours. *Health Care for Women International*: 344–350.
2. Vytrisalova M, Blazkova S, Palicka V, et al. (2008) Self-reported compliance with osteoporosis medication—Qualitative aspects and correlates. *Maturitas*. **60**:223–231.
3. Lypaczewski G, Lappe J, Stubby J. (2002) 'Mom & Me' and Healthy bones. An innovative approach to teaching bone health. *OrthopNurs*. **21**:35– 42.
4. Osteoporosis Society of Canada. Osteoporosis Online—Quick Facts (1999). The Osteoporosis Society of Canada Website. Available from: <http://www.osteoporosis.ca/OSTEO/D05.html>. (accessed 29<sup>th</sup> Dec 2011)
5. Memon A, Pospula WM, Tantawy AY et al. (1998) Incidence of hip fracture in Ku-wait. *Int J Epidemiol*. **27**(5): 860-65.
6. Wallace LS. (2002) Osteoporosis prevention in college women: application of the expanded health belief model. *Am J Health Behav*. **26** (3): 163-72.
7. Varena M, Binelli L, Zucchi F, Ghiring-helli D, Gallazzi M, Sinigaglia L. (1993) Prevalence of osteoporosis by educational level in a cohort of Postmenopausal women. *OsteoporosInt*. **9**(3): 236-41
8. The National Osteoporosis Awareness Plan, March 2004. (accessed 29<sup>th</sup> Dec 2011)
9. Violeta Ribeiro, Judith Blakeley, Mau reen Laryea. (2000) Women knowledge and practices regarding treatment and prevention of osteoporosis. *Health Care for Women International*. **21**: 347 –353

10. Mehmet Urgan, Mehmet Tumer. (2001) Turkish women knowledge of osteoporosis. *Family practice*. **18**:199-203
11. A. G. Juby and P. Davis. (2001) A Prospective Evaluation of the Awareness, Knowledge, Risk Factors and Current Treatment of Osteoporosis in a Cohort of Elderly Subjects. *OsteoporosInt*.**12**:617–622
12. Saw SM, Hong CY, Lee J, Wong ML, Chan MF, Cheng A, Leong KH.(2003)Awareness and health beliefs of women towards osteoporosis. *Osteoporos Int*. **14(7)**:595-601.
13. S. E. Geller and R. Derman. (2001). Knowledge, beliefs, and risk factors for osteoporosis among African-American and Hispanic women. *J Natl Med Assoc*.**93(1)**: 13–21
14. Williams, B., Cullen, L. & Barlow, J. H. I never realized how little I knew: a pilot study of osteoporosis knowledge, beliefs and behaviours. *Health Care for Women International*, **23**: 344-350
15. Terrio, K. & Auld, G.W. Osteoporosis knowledge, calcium intake and weight bearing physical activity in three age groups of women. *Journal of Community Health*.**27 (5)**: 307-320
16. Saw SM, Hong CY, Lee J, Wong ML, Chan MF, Cheng A, Leong KH.(2003)Awareness and health beliefs of women towards osteoporosis. *Osteoporos Int*. **14(7)**:595-601
17. Saw SM, Hong CY, Lee J, Wong ML, Chan MF, Cheng A & Leong KH. (2003) Awareness and health beliefs of women towards osteoporosis. *Osteoporosis International*, **14 (7)**:595-601
18. Kristal D. Anderson, Karen E, and Kevin S. Spink.(2005) Osteoporosis knowledge, beliefs, and practices among adolescent females. *Journal of Adolescent Health*. **36**:305–312
19. Saw SM, Hong CY, Lee J, Wong ML, Chan MF, Cheng A, Leong KH.(2003) Awareness and health beliefs of women towards osteoporosis. *Osteoporos Int*. **14(7)**:595-601.
20. Rosemary Masterson RGN. (2006) A descriptive survey of the knowledge of female orthopedic patients in Ireland about the effects, the risk factors and the prevention of osteoporosis. *Journal of Orthopaedic Nursing*.**10**:98–105
21. Sally Gurney, Jane Simmonds 1. (2007) Osteoporosis: a teenage perspective. *Physiotherapy*. **93**:267–272
22. Pauline S.M. Lai, S.S. Chuab, S.P. Chan, W.Y. Low. (2008) The validity and reliability of the Malaysian Osteoporosis Knowledge Tool in postmenopausal women. *Maturitas*.**60**: 122–130
23. Krystallenia I. AlexandrakiVassilikiSyriou , Panayiotis D. Ziakas ,Nikolaos V. Apostolopoulos , Antonios I. Alexandrakis , Christina Piperi ,EkateriniKavoulaki , IoannisMyriokefalitakis , GeorgiosKorres ,EvanthiaDiamanti-Kandarakis.(2008) The knowledge of osteoporosis risk factors in a Greek female population. *Maturitas*. **59**:38–45

24. Mehmood Riaz, Naushad Abid, Junaid Patel, Muhammad Tariq, Muhammad Shoaib Khan, LubnaZuberi.(2008)Knowledge about Osteoporosis among healthy women attending a tertiary care. *JPMA*.**58**:190
25. L. Abushaikha, S. Omran and L. Barrouq. (2009) Osteoporosis knowledge among female school students in Jordan. *Eastern Mediterranean Health Journal* 16(2):228-32
26. Swan SimYeap, Emily Man Lee Goh and Esha Das Gupta. (2010) Knowledge about Osteoporosis in Malaysian population. *Asia-Pacific Journal of Public Health* **22(2)**:233 – 241
27. Patil Sapna S, Hasamnis Ameya A, JenaSK, Rashid AK & Narayan KA. (2010). Low awareness of osteoporosis among women attending an urban health centre in Mumbai, Western India. *Malaysian Journal of Public Health Medicine*.**10(1)**: 6-13
28. Monsanto HA. (2010)Level of awareness about osteoporosis among women 50 years and older in Puerto Rico. *P R Health Sci J*.**29(1)**:54-9
29. Marti Ali, S.M Tariq, Aslam Siddiqui, Nauman Hussain , Adnan, Imran.(2011).Awareness of Osteoporosis in health literate urban women of Karachi. *The Journal of Pakistan Orthopedic Association*.23 (**2**)
30. Nguyen NV, Dinh TA, Ngo QV, Tran VD, Breitkopf CR. (2011)Awareness and Knowledge of Osteoporosis in Vietnamese Women. *Asia Pac J Public Health*.PMID: 22087035
31. Rosenstock IM. (1996)Why people use health services.(1996) *MilbankMem Fund Q* 44: 94-121
32. Strecher VJ, RosenstockIM (1997).The health belief model. In: Glanz K, Lewis F, Rimer B, eds. *Health Behavior and Health Education:Theory, Research, and Practice*, 2nd edn. San Francisco, CA: Jossey-Bass:41–59