



## Original Article

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

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### ABSTRACT

**Background:** Osteoporosis, a significant public health concern, necessitates informative health interventions due to its largely modifiable risk factors. Non-pharmacological approaches play a vital role in managing this condition. This survey aimed to assess the impact of an educational intervention on osteoporosis knowledge among nursing professionals.

**Objective:** The primary objective was to evaluate the effectiveness of a health information brochure as an educational tool in enhancing osteoporosis awareness among nurses.

**Methods:** Employing a comparative cross-sectional design, the study systematically sampled 278 nurses using the Roasoft calculator. Data were collected through a pre- and post-intervention osteoporosis quiz, with a health information brochure utilized for the intervention.

**Results:** The study achieved a 100% response rate. Pre-intervention, 70.9% of nurses correctly identified that osteoporosis affects both genders, which increased to 82.4% post-intervention. Statistical analysis revealed a weak correlation in bone health knowledge ( $r=0.35$ ,  $p<0.001$ ), a strong association in understanding risk factors ( $r=0.70$ ,  $p<0.001$ ), and treatment and prevention ( $r=0.89$ ,  $p<0.001$ ). Significant differences in knowledge improvement were confirmed through paired t-test statistics.

**Conclusions:** The survey demonstrated a statistically significant improvement in osteoporosis knowledge following the educational intervention. The results advocate for the integration of enhanced osteoporosis-related education in nursing curricula and continuing education programs, addressing the identified gap in responsiveness and knowledge as a barrier to optimal patient care.

**Keywords:** Osteoporosis, Nursing Education, Health Awareness, Non-pharmacological Management, Public Health.

### INTRODUCTION

Osteoporosis, estimated to affect over 200 million people globally, is a significant public health concern, particularly among older men and women post-menopause (1). Characterized by weakened and porous skeletal bones due to tissue loss, this medical condition often progresses silently and asymptotically in its early stages. Patients typically experience symptoms such as stooped posture, frequent bone fractures, height reduction, and back pain due to fractures or collapsing vertebral columns (2). The disease predominantly impacts areas like the wrists, ribs, hips, and spine, leading to fractures that are either cracks or complete collapses, with hip and vertebral compression fractures being notably prevalent (3).

The etiology of osteoporosis is linked to various factors, including inadequate intake of calcium and vitamin D, early menopause, prolonged use of certain medications like corticosteroids, chronic alcohol use, smoking, and reduced physical activity (4). While lifestyle changes such as regular exercise, a balanced diet rich in calcium and vitamin D, moderation in alcohol consumption, smoking cessation, and maintaining a healthy weight can aid in



prevention, certain risk factors like age, gender, family history, hormonal imbalances, and body type are unchangeable (5-7). Despite the existence of international and national treatment guidelines, there is a gap in actual practice adherence, underlining the need for lifestyle modifications and dietary adjustments for both disease management and quality of life enhancement (8).

In Pakistan, a notable prevalence of osteoporosis has been recorded, with an estimated 9.90 million affected individuals, majority being women. This number is expected to rise, highlighting the urgency for effective management strategies (9). Nurses, as front-line healthcare providers, are in a unique position to educate patients and the public about osteoporosis prevention. However, global studies indicate a lack of osteoporosis awareness among nursing professionals, emphasizing the need for health education programs (10-12). These programs, focusing on chronic diseases with modifiable risk factors like osteoporosis, are essential in disease management and can significantly reduce patient fracture risks and the associated healthcare burden (13, 14).

This study, conducted at the Pakistan Institute of Medical Sciences, aims to fill the research gap by assessing the impact of an educational intervention on osteoporosis awareness among nurses. The hypothesis posits that there is a positive correlation between educational intervention and increased awareness about osteoporosis (15). This is crucial as patient noncompliance is often linked to healthcare providers' lack of knowledge, and educational initiatives can bridge the gap between current practices and standard treatment guidelines (16). Through this study, we aim to improve patient care and outcomes by enhancing nurses' knowledge and understanding of osteoporosis, ultimately contributing to the broader public health goal of osteoporosis management and prevention (17, 18).

## RESULTS

The results in Table 1 depict a notable improvement in osteoporosis knowledge among nurses following the educational intervention. In the domain of Bone Health, awareness about the benefits of high-impact exercise increased from 78.4% to 81.3%, and the recognition that walking does not significantly improve bone health rose from 29.1% to 41.4%. A marked increase was observed in understanding the bone strength building age (78.4% to 90.6%) and the fallacy of bone mass gain after 30 years of age (47.1% to 84.2%). Within Risk Factors, awareness that both genders are equally affected by osteoporosis grew from 70.9% to 82.4%. Recognition of the relationship between alcohol consumption and osteoporosis increased significantly from 52.9% to 80.6%. Similarly, there were increases in the awareness of other risk factors such as the impact of low calcium intake with high caffeine, the importance of vitamin D and calcium, and the risks associated with physical inactivity and smoking. In Treatment and Prevention, knowledge that therapy is available post osteoporosis onset increased from 70.9% to 81.7%, and the understanding of multiple prevention methods improved from 53.6% to 71.9%.

Table 1 Changes in Osteoporosis Knowledge Among Nurses

| Variable  | Pre-Intervention<br>(n=278) | Post-Intervention<br>(n=278) |
|---|-----------------------------|------------------------------|
| <b>Bone Health</b>                                    |                             |                              |
| High-impact exercise improves bone health (true)      | 218 (78.4%)                 | 226 (81.3%)                  |
| Walking significantly improves bone health (false)    | 81 (29.1%)                  | 115 (41.4%)                  |
| Bone strength building age 9-17 years (true)          | 218 (78.4%)                 | 252 (90.6%)                  |
| Bone mass gain after age 30 (false)                   | 131 (47.1%)                 | 234 (84.2%)                  |
| <b>Risk Factors</b>                                   |                             |                              |
| Both genders equally affected by osteoporosis (true)  | 197 (70.9%)                 | 229 (82.4%)                  |
| Alcohol unrelated to osteoporosis (false)             | 131 (52.9%)                 | 224 (80.6%)                  |
| Risk increases with low calcium, high caffeine (true) | 203 (73%)                   | 211 (75.9%)                  |



| Variable  | Pre-Intervention<br>(n=278) | Post-Intervention<br>(n=278) |
|---|-----------------------------|------------------------------|
| Risk unaffected by low vitamin D, calcium (false)                     | 131 (47.1%)                 | 168 (60.4%)                  |
| Physical activity increases osteoporosis risk (false)                 | 131 (47.1%)                 | 254 (91.4%)                  |
| Smoking does not increase risk (false)                                | 106 (38.1%)                 | 114 (41%)                    |
| Rapid bone loss after menopause (true)                                | 218 (78.4%)                 | 261 (93.5%)                  |
| Lower weight females at higher risk (true)                            | 218 (78.4%)                 | 256 (92.1%)                  |
| No risk increase with premature menopause (false)                     | 79 (28.4%)                  | 242 (87.1%)                  |
| Positive family history not a contributor (false)                     | 131 (47.1%)                 | 208 (74.8%)                  |
| <b>Treatment and Prevention</b>                                       |                             |                              |
| Therapy available post osteoporosis onset (true)                      | 197 (70.9%)                 | 227 (81.7%)                  |
| Multiple prevention methods (true)                                    | 149 (53.6%)                 | 200 (71.9%)                  |
| Lack of prevention leads to fractures in >50-year-old females (true)  | 159 (57.2%)                 | 174 (62.6%)                  |
| HRT post-menopause doesn't delay bone loss (false)                    | 131 (47.1%)                 | 182 (65.5%)                  |
| 1 glass of milk for children 9-17 years prevents osteoporosis (false) | 81 (29.1%)                  | 205 (73.7%)                  |
| 1500 mg calcium need post-menopause without estrogen therapy (true)   | 197 (70.9%)                 | 202 (72.7%)                  |

Table 2 presents a statistical analysis of the changes in osteoporosis knowledge among nurses. The mean scores for Bone Health increased from 5.14 to 5.53 post-intervention, with a statistically significant mean difference ( $p < 0.01$ ) and a moderate correlation ( $r = 0.35$ ). Risk Factors showed a notable increase in mean scores from 13.4 to 14.9, with a significant mean difference and a strong correlation ( $r = 0.70$ ,  $p < 0.01$ ). Treatment & Prevention also exhibited an increase in mean scores from 8.2 to 8.5, with a significant mean difference and a lower correlation ( $r = 0.26$ ,  $p < 0.01$ ). These results indicate a significant improvement in knowledge across all categories post-intervention.

Table 2 Sociodemographic Influence on Changes in Osteoporosis Knowledge Among Nurses

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

In Table 3, the data demonstrate the influence of sociodemographic variables on changes in osteoporosis knowledge. Age showed a significant impact, with the 45-59 years group exhibiting the most considerable increase in Bone Health Awareness from 19.0% to 60.3%. The 30-44 years age group showed a substantial increase in Risk Factors awareness from 55.0% to 58.7%. Gender also played a role, with males showing a more significant improvement in Treatment & Prevention knowledge post-intervention (41.4% to 55.2%). Education level impacted awareness, as evidenced by Diploma holders exhibiting a notable increase in Bone Health Awareness from 25.9% to 52.4% and Post RN BSN educated nurses showing increased awareness in Risk Factors from 44.1% to 61.3%. These results suggest that age, gender, and education level significantly influence the effectiveness of educational interventions in osteoporosis knowledge.

Table 3 Sociodemographic Influence on Changes in Osteoporosis Knowledge Among Nurses



| Sociodemographic Variable | Response    | Bone Health Awareness (%) |       | Risk Factors (%) |       | Treatment & Prevention (%) |       |
|---------------------------|-------------|---------------------------|-------|------------------|-------|----------------------------|-------|
|                           |             | Before                    | After | Before           | After | Before                     | After |
| Age                       | 15-29 years | 23.6%                     | 56.4% | 52.7%            | 54.5% | 38.2%                      | 34.5% |
|                           | 30-44 years | 21.9%                     | 48.1% | 55.0%            | 58.7% | 43.11%                     | 33.1% |
|                           | 45-59 years | 19.0%                     | 60.3% | 54.0%            | 66.7% | 44.4%                      | 39.7% |
| P Value                   |             | 0.82                      | 0.21  | 0.95             | 0.37  | 0.76                       | 0.65  |
| Gender                    | Male        | 31%                       | 55.2% | 62.1%            | 51.7% | 41.4%                      | 55.2% |
|                           | Female      | 20.5%                     | 52.2% | 53.4%            | 60.6% | 42.6%                      | 32.5% |
| P Value                   |             | 0.19                      | 0.76  | 0.37             | 0.35  | 0.90                       | 0.01  |
| Education                 | Diploma     | 25.9%                     | 52.4% | 59.5%            | 58.9% | 44.3%                      | 38.9% |
|                           | Post RN BSN | 12.9%                     | 52.7% | 44.1%            | 61.3% | 38.7%                      | 26.9% |
| P Value                   |             | 0.01                      | 0.96  | 0.01             | 0.70  | 0.37                       | 0.04  |

## DISCUSSION

The study's findings underscore the critical role of educational interventions in enhancing osteoporosis knowledge among nurses in Pakistan. The majority of the nursing workforce, predominantly women, reflects the global trend, emphasizing the importance of their role in health education (19). This demographic aspect is particularly relevant considering women's higher lifetime risk of osteoporosis-related fractures. The significant increase in correct responses post-intervention across various aspects of osteoporosis knowledge highlights the efficacy of the educational tools employed (20).

A key observation from the study is the improved understanding of the role of physical activity in osteoporosis prevention (21-23). The increased awareness post-intervention, particularly regarding high-impact exercises and the misconception about walking's impact on bone health, aligns with existing literature emphasizing the importance of targeted physical activities in bone strength (24, 25). This finding is consistent with studies conducted in other regions, such as India, where similar misconceptions were noted among nurses (26).

The study also revealed gaps in knowledge regarding bone development and peak bone mass age, which improved significantly following the intervention. This is crucial for early prevention strategies, particularly in the critical years of bone development (27). The heightened awareness about rapid bone loss post-menopause among the respondents post-intervention is consistent with existing scientific understanding and emphasizes the need for targeted education in this area (28, 29).

In terms of osteoporosis prevention, the study indicated a significant improvement in knowledge about lifestyle changes and the role of calcium and vitamin D, which are consistent with recommended prevention strategies (29). However, certain areas, such as the impact of smoking and excessive caffeine intake on osteoporosis risk, showed less improvement, suggesting the need for more focused educational content in these areas. Comparatively, the study's findings differ from those in Korean studies, particularly regarding the awareness of risk factors like smoking and caffeine intake (10).

This discrepancy underscores the importance of context-specific educational interventions and the need for continuous updates in nursing education curricula.



## CONCLUSION

The survey demonstrated a statistically significant improvement in osteoporosis knowledge following the educational intervention. The results advocate for the integration of enhanced osteoporosis-related education in nursing curricula and continuing education programs, addressing the identified gap in responsiveness and knowledge as a barrier to optimal patient care.

One major implication of these findings is the need for enhanced nursing education. Integrating comprehensive osteoporosis education into nursing curricula can equip future nurses with essential knowledge and skills, enabling them to effectively educate patients and contribute significantly to the prevention and management of osteoporosis. In addition, the results advocate for ongoing professional development programs, such as workshops and seminars, tailored to address identified knowledge gaps and ensure that practicing nurses are kept abreast of the latest information and management strategies in osteoporosis care.

Improved osteoporosis knowledge among nurses also translates into better patient education and care. Well-informed nurses can guide patients more effectively towards lifestyle changes and non-pharmacological interventions, which are crucial in managing osteoporosis, especially considering its modifiable risk factors. This enhanced patient guidance can lead to improved health outcomes and a reduction in the burden of osteoporosis on the healthcare system.

Furthermore, these findings have significant implications for policy-makers and healthcare institutions. Recognizing the importance of and investing in nurse education can be a cost-effective approach to improving public health outcomes. This investment not only benefits patient care but also supports the broader goal of enhancing healthcare quality and efficiency.

The study opens avenues for further research, such as exploring the long-term effects of educational interventions on nurse knowledge and patient outcomes, and investigating the effectiveness of different educational tools and methodologies. In summary, the study provides strong evidence that educational interventions are an effective means of improving osteoporosis knowledge among nurses, highlighting the need for continued investment in nurse education as a key strategy in osteoporosis management and public health.

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