The use of the posture-p questionnaire and the quantitative ultrasound to assess the bone density of postmenopausal women

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Abstract. Osteoporosis must be detected early in order to prevent failures in denture treatment. To this end, tools such as the Posture-P questionnaire and the Quantitative Ultrasound (QUS) are widely used for osteoporosis screening. Posture-P. This study is a diagnostic test that analyzes the sensitivity and specificity of the Posture-P questionnaire towards QUS in assessing the bone density of postmenopausal women. Data was collected through interviews using the Posture-P questionnaire, and bone density was measured using the QUS. The results of this study show that both the sensitivity and specificity of the Posture-P questionnaire towards QUS are quite good, with respective values of 77.23% and 75%. Thus, the Posture-P questionnaire can replace the QUS in osteoporosis screening.

1. Introduction
The higher the age of life expectancy and the larger the elderly population, the higher the rates of health problems such as tooth damage and loss of teeth [1,2], which results in an increased need for maintenance dentures [2]. Dentures are required for functional reasons such as mastication, swallowing and speaking as well as aesthetic purposes [3]. However, an inhibitor of successful denture treatment is osteoporosis [4,5]. Bones that experience osteoporosis lose their ability to bear heavy loads. Osteoporosis in the jaw bones is accelerated by the jaw’s contact with dentures and antagonist teeth [5]. Heath professionals and the community shall provide information to the public about the risks involved with having osteoporosis. Individuals who are affected by osteoporosis have bones that are fragile, porous and easily broken. Moreover, this disease attacks secretly without any special signs and only becomes apparent when a bone finally fractures. Of course, this condition significantly decreases quality of life. Therefore, osteoporosis must be detected as early as possible.

Detecting osteoporosis early in the bones of the mandible, especially in postmenopausal women and the elderly is becoming more important because of the increasing number of elderly people. The Indonesian population of elderly in the year 2020 is expected to be 28.8 million people (11.34%) with a life expectancy of 71.1 years [29]. The increasing number of elderly people and the increasing life expectancy have an impact on the growing needs for dentures [2]. Thus, methods for preventing the failure of dentures due to osteoporosis must be developed before creating treatment plans. In other words, detection of osteoporosis in the mandible bone must be done as early as possible before dental care imitation so that a step treatment plan can be implemented according to the patients’ condition.

The election of the scheme using lingualized occlusion is used so that only the cusp palatal teeth posterior cheeks make contact with the central fossa posterior teeth of the lower jaw to minimize the...
burden of chewing. Routine control should be done once every three months because based on research in the USA, osteoporosis patients who have been using dentures require improvement of their artificial teeth three times more than those who do not suffer from osteoporosis. For a person who has been wearing dentures but displays newly detected osteoporosis, precautionary measures can be taken so that his or her use of dentures remains comfortable and healthy. When osteoporosis is not noted and considered, this can result in the failure of dental counterfeits, as artificial teeth are loose and shake when chewing, causing resorption of excessive bone and the failure of the implant treatment [5,28].

According to data from the Ministry of Health of the Republic of Indonesia in 2005, 41.7% of Indonesians suffered from osteopenia (early osteoporosis) and 10.3% of Indonesians suffered from osteoporosis. This means that two out of every five Indonesian residents are at risk for or already affected by osteoporosis. Osteoporosis is a silent epidemic, meaning that it attacks secretly and without any indicative signs; the disease is only detected when the patient’s bone finally fractures[5]. Therefore, osteoporosis must be detected early [4]. DEXA (Dual Energy X Sunray-Diffused Absorptiometry) is the gold standard of osteoporosis detection [6]. However, this technology is still limited in Indonesia, is difficult to use in research and is not cheap. QUS (Quantitative Ultrasound) is used more widely because its effectiveness for detecting osteoporosis has been well-established, and the QUS correlates well with DEXA on sensitivity and specificity. Posture-P. In addition to the QUS, the Posture-P questionnaire is used to determine osteoporosis in the mandible bones of postmenopausal women. The Posture-P questionnaire has also demonstrated good correlation with DEXA on sensitivity and specificity: 77.06% and 78.45%, respectively. Compared with the QUS, the Posture-P questionnaire is cheaper, easier to carry, easier to use and more effective for use in various places in Indonesia. In remote and rural areas specifically, the Posture-P questionnaire’s ease of dissemination facilitates osteoporosis screening in elderly patients.

However, the suitability of the Posture-P questionnaire with the QUS for measuring the risk factors of osteoporosis has not been established. Thus, the Posture-P questionnaire is not well-received as a tool for osteoporosis screening. To increase confidence in the use of the Posture-P questionnaire method for detecting osteoporosis, research is required to analyze the level of compliance between the Posture-P questionnaire and the QUS. Establishing a high level of compliance between the results of the Posture-P questionnaire and the results of the QUS Posture-P will allow for the Posture-P questionnaire to replace the QUS as a tool to screen for osteoporosis. The Posture-P questionnaire must be viewed with the QUS because QUS has been used for almost two decades as a good screening tool and has proven to be widely and clinically useful. This study sought to determine how much the Posture-P questionnaire could predict osteoporosis in jaw bones.

2. Materials and Method
The subject of this cross-sectional research is the postmenopausal woman who has stopped menstruating for at least a year; is willing to become the subject of research; has signed an informed consent form; does not have a history of diabetes mellitus; has not been undergoing therapy drugs that affect bone density in the past twelve months, such as drugs for diabetes mellitus, osteoporosis, and steroids; is not on a strict diet; is not experiencing mobilization failure (which can be determined measuring the woman’s height and body weight) and is able to communicate.

The materials used included a page of information for the research subjects, an informed consent sheet, the Posture-P questionnaire, stationary, digital scales, roller brush meters (to measure height), the QUS appliance, and model food. The sampling is done using consecutive sampling (nonprobability sampling). There are two variables used in this research: the Posture-P questionnaire, which acted as the predictor variable, and the QUS, which acted as the comparison variable.

A diagnostic test was used as the data analysis method to determine the values of sensitivity and specificity. Loading data was collected through interviews using the Posture-P questionnaire, and Posture-P bone density was measured using the QUS. This study is clinical research where the subjects who want to participate are asked to provide informed consent before the study begins. This research was approved by the ethics committee of the Faculty of Dentistry, Universitas Indonesia.
3. Results and Discussion

3.1 Results

The study was conducted with 105 postmenopausal women who met the criteria of inclusion and were willing to participate in the study. The respondents were from Depok, the suburban of Jakarta, the capital city of Indonesia.

Table 1. The distribution of the values of average age, long menopause, BMI, calcium, Posture-P questionnaire and QUS

| Variables                              | Mean   | Median | Standard Deviation | Minimum | Maximum |
|----------------------------------------|--------|--------|--------------------|---------|---------|
| Age (years)                            | 63.84  | 64.00  | 7.57               | 47.00   | 84.00   |
| Long Menopause (years)                 | 13.85  | 14.00  | 8.37               | 0.00    | 34.00   |
| BMI (kg/ m^2)                          | 25.71  | 25.62  | 4.79               | 13.78   | 34.72   |
| Calcium Intake (mg/ week)              | 3.70   | 3.17   | 0.72               | 4.00    | 5.60    |
| The questionnaire posture              | 40.80  | 39.00  | 19.96              | 4.00    | 95.00   |
| QUS                                    | -2.39  | -2.50  | 0.72               | -3.60   | 0.20    |

Table 1 shows that among the research respondents, the average age was 63.84 years, the average amount of time experiencing menopause was 13.85 years and the average BMI was 25.71 kg/m^2. The median value of calcium intake was 3.1 mg/week (or 453.83 mg/day). This indicates that the respondents may have be obtaining sufficient calcium through diet alone. Based on the Posture-P questionnaire, the median value of the research respondents was included in the category of osteopenia (early osteoporosis). Based on the QUS, the median value of the research respondents was included in the category of osteoporosis.

Table 2. The distribution of the subject based on old age, menopause, BMI, long of exposure, activity score, intake calcium, Posture-P questionnaire and QUS in the form of category data

| Variables                              | Frequency | Percentage (%) |
|----------------------------------------|-----------|----------------|
| Age                                    | 72        | 68.6           |
| Elderly (≥ 60 years)                   | 33        | 31.4           |
| Not Elderly (< 60 years)               |           |                |
| Long Menopause                         | 81        | 77.1           |
| Long (> 5 years)                       | 24        | 22.9           |
| Not long (≤ 5 years)                   |           |                |
| Body mass index (BMI)                  | 48        | 45.7           |
| Thin / normal (< 25 kg/m^2)            | 57        | 54.3           |
| Fat (≥ 25 kg/m^2)                      |           |                |
| Long Exposure                          | 81        | 77.1           |
| Short (< 11.5 minutes/ day)            | 24        | 22.9           |
| Long (≥ 11.5 minutes/ day)             |           |                |
| Activity Score                         | 33        | 31.4           |
| Low (< 15/ week)                       | 72        | 68.6           |
| High (≥ 15/ week)                      |           |                |
| Calcium Intake                         | 32        | 30.5           |
| Less (< 2500 mg/ week)                 | 73        | 69.5           |
| Enough (≥ 2500 mg/ week)               |           |                |
| The questionnaire and posture-P        | 26        | 24.8           |
| Normal                                 | 55        | 52.4           |
| Osteopenia                             | 24        | 22.8           |
| QUS                                    |           |                |
| Normal                                 | 4         | 3.8            |
| Osteopenia                             | 45        | 42.9           |
| Osteoporosis                           | 56        | 53.3           |
Table 2 shows that the majority of the respondents were elderly (68.6%) and had been experiencing menopause for more than 5 years (77.1%). Table 5.2 also shows that 54.3% of the respondents were overweight, 69.5% of the respondents had sufficient calcium intake and 68.6% of the respondents engaged in high activity. However, 77.1% of the respondents were exposed to direct sunlight for a short period of time when performing activities (<11.5 minutes/day). The Posture-P questionnaire indicated that 52.4% of the research respondents were classified as suffering from osteoporosis. The QUS examination showed that 53.35% of the respondents were classified as suffering from osteoporosis.

The results of the Postur-P questionnaire and the QUS presented in Table 2 consists of three data categories: normal, osteopenia and osteoporosis. Though diagnostic tests are always presented in 2x2 tables, the diagnostic test of this study must be changed from two categories into three categories—namely, normal and osteoporosis—so the values of sensitivity and specificity can be calculated. The data described above can be depicted in the form of a diagram, as in Figure 4, and in a table, as in Table 3. Osteopenia was inserted into the abnormal category of osteoporosis. This was determined by considering the purpose of the diagnostic test for this research. Screening for osteoporosis requires a tool with high sensitivity, as osteopenia has already begun to decrease the bone density. QUS detected osteoporosis in more patients than the Posture-P questionnaire did. Moreover, the Posture-e-P questionnaire detects more subjects with healthy bones compared with the QUS.

| Table 3. Examination results: Detection of osteoporosis using QUS versus the Posture-P questionnaire |
|-------------------------------------------------|
| The questionnaire posture-P | QUS                                      |
|                                | Osteoporosis | Normal |
| Osteoporosis                   | 78 (PB)      | 1 (PS) |
| Normal                         | 23 (NS)      | 3 (NB) |
| Total                          | 101          | 4      |

* PB = Positive true; PS = Positive illusion; NS = Negative illusion; NB = true Negative

Table 3 shows the results of the diagnostic test that compared the QUS and the Posture-P questionnaire. Of the 105 respondents, the QUS was able to detect the condition of osteoporosis in 101 of the respondents, while the Posture-P questionnaire was able to detect the condition of osteoporosis in 79 research respondents. Of the 105 research respondents, the QUS detected 4 people with normal bone conditions while the Posture-P detected 26 people with normal bone conditions. Of the 4 respondents who were considered to have normal bone conditions by QUS, 3 of them were also detected as having normal bone conditions by the Posture-P questionnaire. Of the 101 research respondents who were considered to have osteoporosis by QUS, 78 were also detected as having osteoporosis by the Posture-P questionnaire. From these results, the value of compliance between the QUS and Posture-P questionnaire can be calculated as well as the sensitivity and specificity of the Posture-P questionnaire against QUS can be calculated using the following equations.

**Equation 1.** The suitability [1]

$$\text{Suitability} = \frac{\text{the result of true positive (TP) + the result of true negative (TN)}}{\text{Subject Total}} \times 100\%$$

$$\text{Suitability} = \frac{(78 + 3)}{105} \times 100\% = 77.14\%$$
Equations 2. The sensitivity [11]

\[
\text{Sensitivity} = \frac{\text{The result of true positive (TP)}}{\text{(the result of true positive (TP) + the result of pseudo)}} \times 100\% \quad (2)
\]

\[
\text{Sensitivity} = \frac{78}{(78 + 23)} \times 100\% = 77.23\%
\]

Equations 3. The specificity [11]

\[
\text{Spesifisitas} = \frac{\text{The result of true negative (TN))}}{\text{(the result of true negative (TN) + the result of pseudo positive (PP))}} \times 100\% \quad (3)
\]

\[
\text{Sensitivity} = \frac{78}{(78 + 23)} \times 100\% = 77.23\%
\]

Using these equations, the obtained match between the QUS and the Posture-P questionnaire was 77.14%. The value of the sensitivity of the Posture-P questionnaire toward QUS was 77.23%, and the specificity of the Posture-P questionnaire toward QUS was 75%.

3.2 Discussion

This study aimed to analyze the level of compliance between the QUS and the Posture-P questionnaire for assessing bone density in postmenopausal women. This research is a cohort study and employs an observational and diagnostic test design. This design was selected because it can assess the accuracy of the new diagnostic modality: namely, the Posture-P questionnaire compared with the standard diagnostic modality (quantitative ultrasound [QUS]). Using a research design of cut bars, all subjects were observed at one time and measurement was performed only at the time of the examination. The design of the cut bars can be used to examine many variables simultaneously and rarely results in losses to follow up (dropped out) [11,12]. The main benefit of the cut bars design is that it allows for including respondents who are not only patients seeking treatment; thus, the results can be adequately generalized to the larger population [12]. This study consisted of several stages: interview, examination of height and body weight and examination of bone density using the QUS heel. In the procedure of obtaining data through the Posture-P questionnaire, the researchers, assisted by some colleagues, conducted calibration before loading the data so that the quality of the obtained data obtained was maintained. The QUS examination was done by trained and experienced technicians. The study respondents were postmenopausal women. The sampling was conducted using the conform method, where all sampling subjects were matched with the criteria for selection until the total number of subjects needed for the study was fulfilled.

The number of subjects needed to participate in this research was 138. However, only 105 of the subjects complied with the criteria of inclusion, were willing to participate in the research and had signed an informed consent form. Even though the minimum sample size determined in accordance with the formula for the diagnostic test in this research was only 98 people, 105 samples qualified and could be processed as data. The ages of the respondents were grouped into the elderly and not the elderly. Among the subjects, 68.6% were classified as elderly. As age increases, calcium absorption declines and bone density decreases, thus increasing the risk for osteoporosis [5,13]. Kusdhany (2003) concluded that for women under the age of 60 years, the risk for developing osteoporosis in the mandible is lower than that of women who are 60 years or older [4]. Yas‘ar and Akgůnlu (2006) explained that age is an important risk factor in osteoporosis, as the possibility of changes in the morphology of the cortex inferior mandible is higher than in patients who do not experience
osteoporosis [14]. Thus, the majority of the subjects who participated in this research were at risk for developing osteoporosis in their mandible bones and other bones.

The estrogen hormone is important for maintaining healthy and strong bones [15]. Anggraini (2008) shows that the rich soy flour isoflavone has the same effectiveness as estrogen, as the flour contains 17β-estradiol, which can slow or prevent the decrease in the strength of the alveolar bone, the humerus and the femur in sprague dawley hipoestrogenik rats [16]. Women who begin menopause experience a deficiency of estrogen hormone that can reduce the ability to form bones and improve resorbsi bones [5,17]. A study by Anwar (2007) shows that in monkeys, estrogen deficiency causes fragility in the trabecular structure of the alveolar bone in molar teeth. Kusdhany (2003) concluded that women who have experienced menopause for more than 5 years are at greater risk for osteoporosis of the mandible bones than those who had experienced menopause for less than 5 years [4]. The results of the study showed that 77.1% of the respondents experienced menopause for more than 5 years with an average of 13.85 years. Based on the survey, it can be concluded that the majority of the subjects participating in this research were at risk of developing osteoporosis in the mandible bones and other cage bones.

Before menopause, women produce an estrogen hormone called estradiol (E2). Estradiol regulates the menstruation cycle and plays a role in the process of bone remodeling. After menopause, the ovaries produce estron (E1), which is derived from body fat. This estron converts into an active estradiol to maintain healthy and strong bones [15]. Some research shows that increased body mass related to the mass of the fat can improve the strength of the muscles and stimulate the formation of bone (osteoblasts and osteocytes). Morin and Leslie showed that the proportion of women with high bone mineral density increased significantly with body mass index (BMI). On the contrary, low BMI was associated with an increased risk of low bone density and fractures resulting from osteoporosis [13,19]. Similar results were also indicated by Shan et al. (2009), where a low body mass index, < 18.5 kg/ m², was an indication of osteoporosis [20]. In the current study, most of the subjects (54.3%) were overweight (the average BMI was 25 kg/m²). Therefore, the majority of the subjects in this research were at a lower risk of developing osteoporosis in the bones of the mandible and other bones. Moreover, most of the respondents (69.5%) displayed good calcium intake, indicating that their diets adequately fulfil daily calcium requirements (3.176.8 intake mg/ weeks or 453.83 mg/ day). Calcium is needed in the process of mineralization and in maintaining normal bone density. According to the World Health Organization, postmenopausal women must have a minimum calcium intake of 1300 mg/day. Frisco (1999) argued that the recommended calcium intake for postmenopausal women (age > 50 years) is 1500 mg/ day with 400-800 i.u. of vitamin D [17]. Although the calcium intake of most respondents in this study did not meet the levels recommended by the World Health Organization and Frisco, the results of the current study are supported by Kusdhany (2003), who concluded that subjects with a calcium intake of 2500 mg/week have a lower risk of developing osteoporosis in the bones of the mandible compared with those who intake < 2500 mg/ week (< 357.14 mg/ day) of calcium [4]. So, it can be concluded that the majority of the subjects in this research had a lower risk of developing osteoporosis the bones of the mandible and other bones.

Of the respondents, 77.1% spent an average of less than 11.5 minutes per day being exposed to direct sunlight while performing activities. The activities associated with long exposure were playing sports and washing and hanging clothes. In the current study, long exposure did not occur often because most of the respondents wore head covers when conducting activities. Those who are rarely exposed to the sun rays are vulnerable to osteoporosis. The sunlight, especially in the morning and afternoon, is important to trigger the formation of vitamin D₃ and vitamin D (D₃ and D₂: derived from food) will be changed by the kidneys and diseases (i.e. become the kalsitriol hormone). This hormone stimulates osteoblasts in neutralizing the bones [5]. So, it can be concluded that the majority of the subjects in this research were at risk of developing osteoporosis in the bones of the mandible and other bones.

The subjects with high activity (15 consecutive patients/week) constituted 68.6% of the study sample. Physical activity that is done regularly can improve bone density in the elderly by about 2 to
6% [8]. Some research confirms that activities such as walking, swimming and bike riding protect the bones and decrease bone demineralization that occurs with aging [17]. Kosayani (2007) shows that calcium intake and physical activity positively impact bone density in postmenopausal women [17]. So, it can be concluded that the majority of the subjects in this study have a lower risk of being affected by osteoporosis in the bones of the mandible and other bones. Considering the factors of old age, menopause and long sunlight exposure demonstrates that most of the respondents in this study have a high risk of developing osteoporosis. Conversely, the factors of BMI, calcium intake and physical activity shows that most of the respondents are at less risk of being affected by osteoporosis. In addition to detecting osteoporosis in mandible bones, the Posture-P questionnaire can be used to detect osteoporosis in other bones. This is based research which stated that there is a relationship between osteoporosis in the bones of the mandible with other bones. Kusdhany (2003) concluded that there is a correlation between the density of the bones of the mandible and the density of the lumbar femur in postmenopausal women [4]. Poštić (2009) shows that the density of the upper and lower jaw bones decreases in patients with osteoporosis [21]. Taguchi et al. (1995) concluded that osteoporosis in other parts of the body are associated with signs in the mouth among others in the form of the resorbsi alveolar bone, decreased thickness of the mandible cortex and loss of several teeth [22]. Desphane (2009) concluded that the level of resorption of the alveolar bone directly relates with the age of the patient and the level of osteoporosis, but inversely relates with the level of calcium in the food and more often occurs in women.

Patients with osteoporosis experience resorption of the alveolar bone faster compared to patients with normal bones [23]. Similar results have also been demonstrated by Golebiewska and Czajkowska, who found that osteoporosis significantly influenced alveolar bone decline in the mandible bones of postmenopausal women who do not have teeth. Endocrine disorders, especially hyperparatiroid, hyperthyroid and estrogen deficiency contributed to resorption of the alveolar bone of the mandible in patients who do not have teeth [24]. Pluskiewicz et al. (2000) said that there is a significant correlation between bone density of the mandible with bone density of the heel bone femur and the phalangeal bones [25]. Hedstrom et al. (2010) concluded that there is a positive correlation between PI (Pixel Intensity) in the digital radiografi mandible and the bone density of the heel [26]. Vishwanath et al. (2011) showed that the bone density of the alveolar maxilla and the mandible is significantly and positively correlated with bone density of the heel in postmenopausal women [27]. Based on the several studies described above, it can be concluded that there is a correlation between osteoporosis in the bones of the mandible and other bones. This suggests that although the Posture-P questionnaire is more intended for early detection of osteoporosis in the bones of the mandible, the method can also be used for early detection of osteoporosis in other bones.

The Posture-P questionnaire has an important role in the world of dentistry because it can detect osteoporosis in the bones of the mandible. Knowledge of the existence of osteoporosis in the bones of the mandible is critical for the success of dental care, especially in the case of the loss of teeth, which requires impermanent dentures, and the prevention of maintenance prosthodontia failure. Osteoporosis in the bones of the mandible can cause fragility in the trabeculla structure on alveolar bone, resorption and high drop in the alveolar bone, lost teeth and reduced thickness of the bone cortex in the mandible. The bones that experience osteoporosis are less able to hold the load from the contact between teeth and denture adversaries, thus resulting in rapid shrinking of the jaw bone. There are several efforts that can be made to prevent the failure of dental care: the mechanical burden can be minimized as much as possible, the distribution of the burden that falls onto the area of the alveolar bone can be made as flat as possible, scheme selection may use lingualized occlusion and routine control must be conducted. To make the area in which the distribution of the burden falls as flat as possible, there are two things that need attention at the time of printing: the base surface must be as wide as possible, and the distance to the base must be as close as possible to the mucosa. This also requires obtaining the closest contact and a strong retention style. In patients with osteoporosis, vertical occlusal dimensions are quite low but still fall within the normal limit. This is aimed to reduce the burden on the alveolar bone. The diminution of the occlusal surface teeth element can also minimize the burden of chewing.
A diagnostic test was conducted to compare the P-Posture questionnaire and the QUS to determine whether the Posture-P questionnaire can be used as a tool to screen for osteoporosis. Initially, the examination results of the Posture-P questionnaire and the QUS c consisted of three categories: normal, osteopenia and osteoporosis. Because diagnostic tests always appear in the form of a 2 x 2 table, the three categories were changed to two categories: normal and osteoporosis. The results of the study showed that QUS detected more subjects with osteoporosis when compared with the Posture-P questionnaire. This is because the value of sensitivity toward DEXA QUS (IDR 83.9%-87.5%) was higher when compared with the Posture-P questionnaire against DEXA (77.06%). However, only 4 of the 105 subjects were detected as normal by the QUS. Unlike the QUS, 26 of the 105 subjects were detected as normal by the Posture-P questionnaire. The Posture-P questionnaire has a higher value of DEXA specificity (78.45%) that the QUS against DEXA (45.5%-51%). This is why the Posture-P questionnaire is able to detect the condition of normal bones better than the QUS can. The purpose of the diagnostic test in this research is to determine whether the Posture-P questionnaire can effectively screen for osteoporosis with a high sensitivity value. The Posture-P questionnaire with a high sensitivity is expected to detect osteoporosis as early as possible in order to enact preventive measures. It is undeniable that the risk of a high sensitivity is a false positive, where patients actually have healthy bones but are detected to have abnormal bones according to the Posture-P questionnaire. Even so, false positives are better than negative pseudo effects. Negative facades occur on diagnostic tools with low sensitivity, where patients actually have abnormal bones but indicate healthy bones on a diagnostic screening tool. This is very dangerous because the patient will feel and act as if his or her bones are healthy when, in fact, the condition of his or her bones is abnormal.

4. Conclusion
It can be concluded that the Posture-P questionnaire can be used as a replacement for the QUS to screen for osteoporosis. Compared with the QUS, the Posture-P questionnaire is simpler, cheaper and its use is more secure and relatively easy. Therefore, health workers and communities, especially in remote areas and areas that lack funding and access to health, should implement the use of the Posture-P questionnaire to provide early detection of osteoporosis. In the field of prosthodontia, information to the public through print media or electronic media regarding the importance of osteoporosis must be provided. Moreover, osteoporosis must be considered before healthcare providers determine treatment plans in order to prevent denture failure.

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