

Risk assessment on osteoporosis and its association with physical activity and sun exposure among selected menopausal women

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Abstract:

Osteoporosis is a skeletal disorder caused due to decreased density of bone mass. Low bone density is becoming increasingly common among middle aged women population in relation to age and gender. There are several causes for osteoporosis like low intake of calcium, lifestyle changes consisting of low physical inactivity, inadequate exposure to sunlight being the critical factors.

A well-structured interview schedule was used to collect data on demographic profile, physical activity, exposure to sunlight and menopausal stage of selected subjects. The data on physical activity of subjects were collected based on International Physical Activity Questionnaire (IPAQ). The sunlight exposure pattern of the subjects were observed as adequate (more than 30 minutes of sun exposure) and inadequate (below 30 minutes). The research exhibits that post-menopausal women are at risk of osteoporosis compared with other subjects. There was statistical association between physical activity and sunlight exposure with osteoporosis risk. So adequate physical activity and sun exposure helps in prevention of osteoporosis.

Key words: Osteoporosis, IPAQ, physical activity, sun exposure

Introduction:

Osteoporosis is a skeletal disorder caused due to decreased density of bone mass. Low bone density are increasingly common among middle aged women population in relation to age and gender (Kopiczko *et al.*, 2018). Osteoporosis is diagnosed mostly in postmenopausal women (Ferrari *et al.*, 2012). Osteoporosis is asymptomatic but rarely on later stages there might be incidence of non-traumatic fractures. There are several causes for osteoporosis like low intake of calcium and lifestyle changes like physical inactivity, inadequate exposure to sunlight etc.

A balanced diet and intake of dietary supplements provides adequate nutrients such as calcium, protein, vitamin D and K improves bone health (Weaver, 2017). Another important risk factor of osteoporosis is insufficient exposure to sunlight. Sunlight is an important source of vitamin D (Kopiczko *et al.*, 2014). Adequate amount of physical activity is essential to maintain bone health and to prevent osteoporosis. Weight bearing exercises and resistance exercise are important for improving bone density (Ma *et al.*, 2013)

In addition to physical activity, various studies indicate a number of other factors which influence bone parameters. Some of the other important factors include the history of fractures in the family, low body mass index and poor body musculature, lack of active forms of vitamin D. All these factors account for about forty percentage of BMD variability (Baczyk *et al.*, 2011) (Saag *et al.*, 2009). The

present study aims at determining the risk of osteoporosis among selected women subjects and to analyze the association of physical activity and sun exposure with osteoporosis risk.

Materials and methods:

Selection of study area:

Based on easy accessibility for the investigator, areas in and around Coimbatore and Tiruppur districts where there are sufficient number of willing women subjects at the menopausal stage were selected as the area to perform the study.

Selection of sample:

Women at various menopausal stages were selected for the study and those menopausal stages include peri-menopause, menopause and post menopause. Peri-menopause is when menstrual cycles are irregular, but they haven't stopped. Menopause is period where menstrual cycle stops. When a woman does not bleed for an entire year then it is termed as post-menopausal stage (Traci, 2020).

Tools used for the study:

A well-structured interview schedule was used to collect data on demographic profile, physical activity, exposure to sunlight and menopausal stage of selected subjects.

The data on physical activity of subjects were collected based on International Physical Activity Questionnaire (IPAQ). International Physical Activity Questionnaire includes data on job related physical activity, transport related physical activity, house work, house maintenance and caring for family related physical activity, recreation, sport and leisure time physical activity and time spent sitting from which scores are given based on IPAQ and according to that scoring, the physical activity of subjects were assessed. (Cuisle, 2002)

Exposure to sun light is a great source of vitamin D which maintains peak bone mass, which is one of the key factors to prevent osteoporosis (Eamon, 2010). The sunlight exposure pattern of the subjects are classified as above 30 minutes of sun exposure (adequate) and below 30 minutes (inadequate) of exposure to sunlight based on findings of Harinarayan,2018.

Risk assessment tool:

The Osteoporosis Risk Assessment Instrument (ORIA) has been used to assess the osteoporosis risk of selected subjects. This can help reduce the number of women who are screened so that resources can be used for those at risk. (Ahmadzadeh *et al.*, 2014).

ORAI tool contains questions on certain parameters like Age in years, weight in kilograms. The age, weight and estrogen usage are given scores as per the classification shown in the table below. Then the scores of three parameters are added together to get the final score. When the final score is above 9 it was considered as at the risk of osteoporosis.

Variables	cores
Age	
≥55	5
45-74	5
55-64	5
44-54	5
Weight	
≤60	5
60-69	5
≥70	5
Estrogen usage	
No	5
Yes	5

Collection of data:

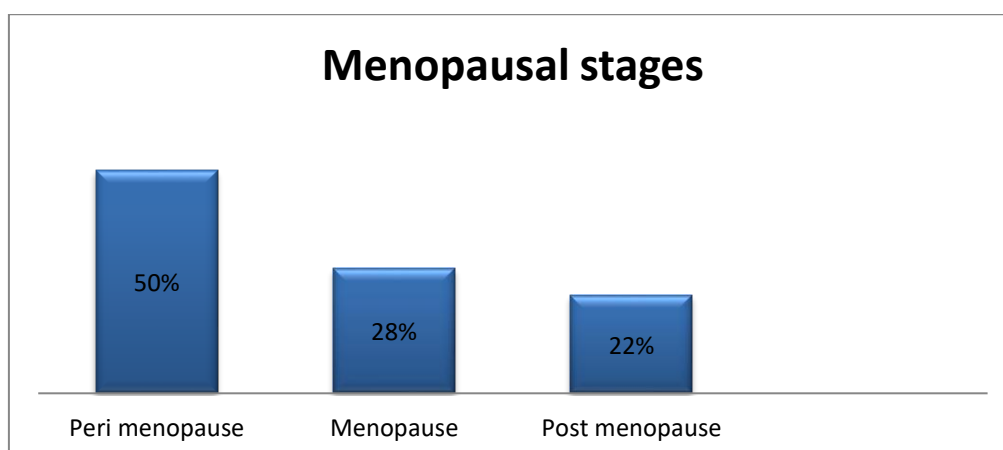
The data was collected from the selected subjects based on the interview schedule as mentioned above. Data was collected from the subjects with the criteria which includes female subjects of age above 40 years who are at menopausal stage without any chronic illness and disabilities and those who are willing to participate in the study.

Analysis of data:

Data collected from the interview schedule was coded and was analyzed using SPSS 21 (Statistical Package for Social Sciences).

Results and Discussion:

Among 1036 selected subjects, nearly 99 percentage of the subjects were married and remaining one percent were unmarried. All selected subjects were between 40 and 64 years. Maximum number of subjects belong to nuclear family, 23% of them belong to joint family and only 5% were from extended family.



As the chart indicates 50% of subjects were under peri-menopausal stage, 28% were under menopause and a minimum of 22% subjects were under post-menopausal stage.

	No risk		At risk		Total
	Number	Percentage	Number	Percentage	
Risk assessment using ORAI	58	35	78	65	136

Table 2. Osteoporosis Risk Assessment

As the table indicates, according to the osteoporosis risk assessment performed by ORAI tool 65% of the subjects are at risk of osteoporosis and only 35% of them are not at risk.

Risk assessment	Menopausal stages						Total	PValue	Pearson chi square
	Peri-menopause		Menopause		Post-menopause				
	No.	Percentage	No.	Percentage	No.	Percentage			
No risk	203	31	102	36	13	11	58	0.000	0.108 ^a
At risk	193	69	184	64	101	79	78		
Total	396		286		114		136		

Table 3. Osteoporosis risk and menopausal stage

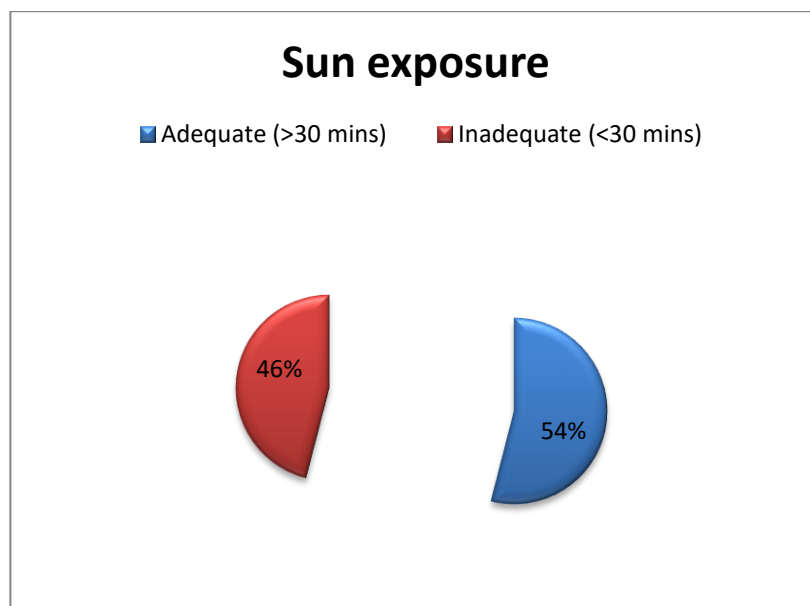
The table indicates that more than half of women i.e. 59% in the premenopausal stage were at risk of osteoporosis. 64 percent of women at menopausal stage were at risk of osteoporosis and the highest of 79% of postmenopausal women were at risk of osteoporosis. Post-menopausal women are at a higher risk of osteoporosis compared to peri and menopausal stage women. Table shows that there was a statistically significant relationship between osteoporosis risk and menopausal stage of subjects as the p value is <0.01.

Timing	More than 30 minutes	Less than 30 minutes	Total
Between 7 and 9am	179	28	207
Between 9 and 11 am	120	29	149
Between 11am and 1pm	137	89	226
Between 1 and 3pm	103	10	113

between 3 and 5pm	38	89	27
between 5 and 7pm	02	68	70

Table 4.Sun exposure timing

The Table further reveals the sun exposure pattern of subjects. Majority of subjects numbering 749 are exposed to sunlight between 9 am to 11 am and among them 420 are exposed more than 30 minutes and 329 are exposed below 30 minutes. About 313 subjects are exposed to sunlight between 1 and 3 pm. Among this group 103 are exposed for more than 30 minutes and 210 are exposed below 30 minutes.



Sun exposure	Risk assessment				Total	p-value	Pearson chi square
	Low risk		High risk				
	Number	Percentage	Number	Percentage			
Inadequate (<30 mins)	75	9	37	9	112	000	343 ^a
Adequate (>30 mins)	33	1	91	3	124		

total	58		78		1036		
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Maximum of 54% of the subjects have sufficient amount of sunlight exposure and 46% of the subjects were exposed to sunlight insufficient. Among 1036 samples only 474 subjects had

Table 5. Association between sun exposure and osteoporosis risk

Table depicts the relationship between sun exposure and osteoporosis risk. As the table indicates, a maximum of 69% of at risk subjects have inadequate exposure to sunlight. And 51% of the subjects who are adequately exposed to sunlight have no risk of osteoporosis. 49% of no risk and 43% of at risk subjects are inadequately and adequately exposed to the sunlight respectively. There is significant relationship between sun exposure and osteoporosis risk as p value is more than 0.01. The subjects exposed inadequately are at higher risk of osteoporosis than the subjects who are exposed adequately to sunlight.

Physical activity	Number of samples	Percentage
High	248	24
Moderate	408	39
Low	380	37
total	1036	

Table 6. Physical activity of selected subjects

Table shows the physical activity level of selected subjects. Majority of the subjects are under moderate level of physical activity. Least number of subjects only 248 subjects perform high physical activity.

Physical activity (IPAQ,2002)*	Risk assessment				total	p value	Chi square value
	No risk		At risk				
	Number	percentage	Number	percentage			
High	22	6	56	3	48	0.00	1.434
Moderate	51	2	57	8	108		
Low	15	2	65	9	80		
total	58		78		1036		

Table 7. Physical activity and risk assessment

Table shows the association between physical activity performed by subjects and their osteoporosis risk. As the table depicts maximum of at risk subjects about 39% perform low physical activity. And maximum of no risk subjects for about 42% perform moderate physical activity.

Conclusion:

The study concludes that physical activity plays a major role in the prevention of osteoporosis in menopausal women and sunlight exposure is essential to maintain healthy bone density. Post-menopausal women are more prone to low bone mineral density when compared to peri menopausal and menopausal stages. So adequate physical activity and sufficient sun exposure are very critical for prevention of osteoporosis among women especially at post-menopausal stage.

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