

# A cross-sectional study to screen community health volunteers for hip/knee-osteoarthritis and osteoporosis

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## ABSTRACT

**Context:** Osteoarthritis (OA) is a degenerative disease mainly affecting hip and knee joints, and osteoporosis is characterized by diminution of bone mass. Both these diseases have a substantial economic impact on society. Community health volunteers (CHVs) being peripheral health workers are prone to such diseases owing to their sociodemographic and occupational profile. **Aim:** This study was conducted to estimate the proportion of hip/knee OA and osteoporosis among CHVs and understand determinants of their current bone health status. **Materials and Methods:** Screening for OA was done using a tool adopted from a previous study after obtaining due permissions. Weight, height, blood pressure, and bone mineral density of all participants were recorded. Statistical tests such as Chi-square and multiple logistic regression were used for analysis of data. **Results:** Out of 80 participants, 50 (62.5%) had increased body mass index (overweight + obese), 10 (12.5%) were hypertensive, 14 (17.5%) CHVs screened positive for hip OA, and 29 (36.3%) were positive for knee OA. Hip OA was associated with advancing age, parity, and obesity. Knee OA was associated with age and exercise. In total, 16.3% subjects were found to have osteoporosis and 61.2% had osteopenia. **Conclusions:** This study showed that a remarkable proportion of CHVs had bone and joint problems. CHVs must, therefore, receive preventive measures such as health education and screening for these diseases.

**Keywords:** Bone mineral density, Community Health Volunteers, osteoarthritis, osteoporosis

## Introduction

Osteoarthritis (OA) is a degenerative disease that affects the knee and hip joint more frequently. The economic impact of the disease is substantial and is on the rise.<sup>[1]</sup> According to a study conducted on the NHWS, USA data of 2009, the mean annual unadjusted health cost incurred by workers suffering from pain due to OA was almost double than the cost incurred by the comparator group.<sup>[2]</sup> According to Oxford Economics, the direct cost of arthritis (both RA and OA) in UK for the year 2008 was 6.1 billion pounds.<sup>[3]</sup> As estimated by Global burden

of Osteoarthritis, 14,230 DALYs including 2254 DALYs from SEARO-D region (that included data from India) were lost due to OA.<sup>[4]</sup> The above figures emphasize upon the fact that OA may be considered as an important public health problem. Osteoporosis causes diminution of bone mass without detectable changes in the ratio of mineralized to nonmineralized matrix. On the basis of the World Health Organization (WHO) definition, it is estimated that >30% of women >50 years of age suffer from osteoporosis.<sup>[5]</sup>

Community health volunteers (CHVs) are peripheral health workers working under various municipal wards. They are front-line health workers with job responsibilities of conducting surveys and home visits for beneficiaries such as

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pregnant/lactating women, under-five children, tuberculosis patients, etc., They are required to keep manual records of their outreach work which involves sitting at a desk or on the floor for long hours. They predominantly belong to a lower socioeconomic stratum and have minimum access to advanced screening, diagnostic, and treatment procedures.

A review of studies related to osteoporosis published in 2015 showed that osteopenia among Indian women varied from 29% to 53%. This proportion may be as high as 62% in postmenopausal women. Similarly, the prevalence of osteoporosis among Indian women also varied from 8% to 44%, as was reported by various studies conducted across the country.<sup>[6]</sup> As per an article published on proportions of OA among Indians, it was shown that 11% of women had OA in the Indian state of Maharashtra where this study was carried out.<sup>[7]</sup> All CHVs being women are vulnerable to bone and joint problems, which may cause discomfort in their job. Also, very few previous studies could be found, which were carried on peripheral health workers for OA and osteoporosis. Hence, this study was planned on CHVs to estimate the proportion of hip/knee OA and osteoporosis and look for determinants of their bone/joint health status.

## Subjects and Methods

This study was planned in the urban field practice area of a teaching college in Mumbai. The study participants included CHVs of a municipal ward of Mumbai. The municipal ward has seven health posts. Out of these, five health posts were randomly selected. The total number of CHVs employed under these five health posts was 96. About 16 out of these 96 CHVs did not take part in this study as they had duties elsewhere. Hence, the final sample size for this study was 80. After taking consent from all participants, a preformed validated questionnaire was

used to obtain information from the study participants. The questionnaire included a screening tool for OA taken from a previous study after due permissions.<sup>[1]</sup> Questions in the screening tool were modified to suit the local lifestyle [Figure 1]. Weight, height, and blood pressure of the study participants were recorded using the standard instruments. Bone mineral density at the level of ankle (right side for uniformity) was measured using a DEXA scan machine, and T-score, thus, obtained was recorded.

Operational Definitions used in this study:

- Body mass index (BMI) was classified into normal, overweight, and obese as per WHO definition.<sup>[8]</sup>
- On the basis of blood pressure, subjects were classified into hypertensive and normotensive as JNC-7 classification. Besides, if there was a history of treatment for higher blood pressure, such a subject was also considered as hypertensive for this study.<sup>[9]</sup>
- Osteoporosis was classified as per WHO definition on the basis of T-score.<sup>[10]</sup>
- Figure 2 demonstrates strategy for inferences from the screening tool.

## Results

Out of the 80 CHVs who took part in this study, 57 (61.3%) were between 30 and 59 years and 12 (15%) were more than 60-year old. About 59 CHVs (73.7%) had up to two children, whereas the rest had three or more children.

It was seen that 14 participants (17.5%) were screened positive for hip OA [Table 1a]. On applying the screening tool for knee joint problems, 29 CHVs (36.3%) were found positive for knee OA [Table 1b].

More than 60% of CHVs had BMI higher than the upper normal limit. Also, 12.5% participants were classified as hypertensive [Table 2]. When asked about their lifestyle, it was found that only 23 out of 80 participants exercised regularly. Out of the 23, 19 participants exercised  $\geq 5$  days/week (as recommended),

**Figure 1: Screening tool used for hip/knee osteoarthritis<sup>[1]</sup>**

Concerning the hip:

Q1. During the last 4 weeks, have you had pain in the hip, groin, or in the upper thigh? Yes/No

Q2. Do you have pain in the hip, groin, or in the upper thigh while climbing stairs or walking down slopes or in squatting? Yes/No

Q3. Do you have a limitation in the range of motion of one or both hips? Yes/No

If yes to Q1, Q2, or Q3:

Q4. Did you consult a doctor for these symptoms during the last 3 months? Yes/No

Q5. What was the diagnosis of the doctor? Yes/No

Concerning the knee:

Q6. During the last 4 weeks, have you had knee pain? Yes/No

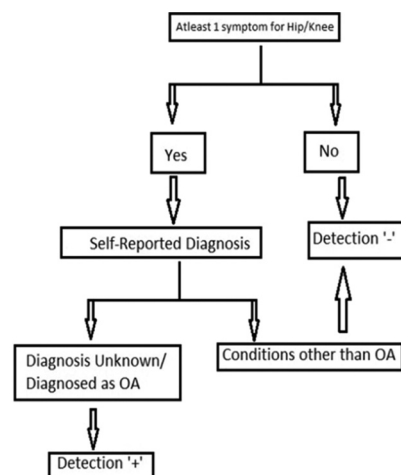
Q7. Do you have knee pain while climbing stairs or walking down slopes or in squatting? Yes/No

Q8. During the last 4 weeks, have you had swelling in one or both knees? Yes/No

If yes to Q6, Q7, or Q8:

Q9. Did you consult a doctor for these symptoms during the last 3 months? Yes/No

Q10. What was the diagnosis of the doctor? Yes/No



**Figure 2: Inference strategy for hip/knee OA screening tool**

**Table 1a: Proportion of Hip Osteoarthritis among study participants**

No Symptoms Present	At least 1 symptom present but with self-reported diagnosis other than Hip OA	At least 1 symptom present and self-reported diagnosis of Hip OA or an unknown diagnosis
Detection Negative 62	Detection Negative 4	Detection Positive 14

**Table 1b: Proportion of Knee Osteoarthritis among study participants**

No Symptoms Present	At least 1 symptom present but with self-reported diagnosis other than Knee OA	At least 1 symptom present and self-reported diagnosis of Knee OA or an unknown diagnosis
Detection Negative 40	Detection Negative 11	Detection Positive 29

**Table 2: Distribution of body mass index (BMI) and blood pressure (BP)**

BMI	Number	Percentage	BP	Number	Percentage
Normal	30	37.5	Normotensive	70	87.5
Overweight	33	36.2	Hypertensive	10	12.5
Obese	17	26.3	Total	80	100
Total	80	100			

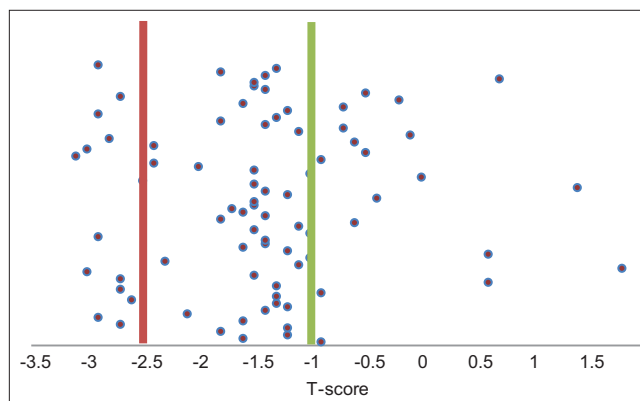
but only eight participants exercised for the recommended time of >30 min/day.

Bivariate analysis was done using Chi-square or Fischer exact test and multivariate analysis using multiple logistic regression [Table 3]. The proportion of CHVs screened positive for hip OA increased with age. Parity was significantly associated ( $P = 0.042$ ) with hip OA. Participants with higher BMI were more likely to be screened positive. Surprisingly, the proportion of hip OA was higher among participants who gave history of doing exercises.

Increasing age of participant was significantly associated ( $P = 0.001$ ) with chances of developing knee OA. Participants with higher BMI (overweight and obese category) and with higher parity had more chances of developing knee OA. In this study, it was found that participants who exercised regularly were protected from developing knee OA ( $P = 0.01$ ).

Multivariate analysis showed that for hip OA, age between 30 and 59 years, parity of three to five children, overweight/obese as per BMI, and history of doing exercises had higher odds of being screened positive. CHVs with normal blood pressure were protected against hip OA. Similarly, for knee OA, age between 30 and 59 years, higher BMI, and higher parity were determinants with higher odds ratio for being positive in the screening test. Again the participants having normal blood pressure were protected.

Thirteen participants (16.3%) had osteoporosis and another 49 CHVs (61.2%) were having osteopenia. The T-score distribution

**Figure 3: Distribution of T-score of study participants**

[Figure 3] shows that most of the study participants were concentrated around the line representing T-score of  $-1$  (cutoff between normal and osteopenia). Most people with normal score had values between 0 and  $-1$ , i.e. they were inclined toward the lower limit of normal category.

## Discussion

Bone and joint diseases, though on the rise, are neglected public health problems. In a background paper on OA by the WHO, it was concluded that there is a large burden of OA and absence of effective biomarkers and diagnostics one of the main reasons.<sup>[11]</sup> Varthakavi *et al.* concluded that osteoporosis was a neglected health problem in India and lack of detection and unawareness were the main reasons.<sup>[12]</sup> Hence, previous published literatures support the fact that these diseases may go undiagnosed and thereby untreated in many patients. The primary care givers such as family physicians can detect these diseases early with use of cost-effective screening tools. Peripheral health workers such as CHVs deserve priority screening as they are responsible for overlooking the health of the community.

This study showed that advancing age, higher parity, and positive history of exercise were major determinants for hip OA. Exercise is generally labeled as protective against OA. An inverse relation may have occurred as a result of inappropriate exercise choices or even more likely due to a minuscule number of participants giving history of undertaking regular exercise. Regression analysis showed that the age group of 30–59 years had odds of 3.04 for hip OA. These findings are similar to an overview of hip OA done by Jotanovic *et al.* in which they found that advancing age was one of the significant factors influencing hip OA.<sup>[13]</sup> Hip OA was also associated with increase in BMI (odds of 7.6 for overweight and 6.8 for obese group). These findings are consistent with a previous study conducted by Sharma *et al.*<sup>[14]</sup>

Advancing age was also significantly associated with knee OA (odds = 20.78,  $P = 0.016$ ). In a previous study, Pal *et al.* also found that advancing age was significantly associated with knee OA.<sup>[15]</sup> Participants with higher parity had 1.33 times more chance of a positive screening result. Pregnancy-related weight gain may be

**Table 3: Bivariate and multivariate analysis for hip and knee OA (bivariate analysis using Chi-square/Fischer Exact test and multivariate analysis using multiple logistic regression)**

Variable	Category	Total	Hip osteoarthritis			Knee osteoarthritis		
			Positive	Bivariate analysis	Multivariate analysis (OR and P)	Positive	Bivariate analysis	Multivariate analysis (OR and P)
Age (year)	<30	11	1 (9.1%)	$P=0.069$	1	2 (18.2%)	$P=0.001^*$	1
	30-59	57	8 (14%)		3.04 (0.17-54), 0.449	17 (29.8%)		20.78 (1.7-246), 0.016*
	≥60	12	5 (41.7%)		0.3 (0.02-4.2), 0.377	10 (83.3%)		0.72 (0.1-5.15), 0.746
Parity	0-2	59	7 (11.9%)	$P=0.04^*$	1	18 (30.5%)	$P=0.073$	1
	3-5	21	7 (33.3%)		2.44 (0.58-10.3), 0.223	11 (52.4%)		1.33 (0.37-4.71), 0.657
Obesity	Normal	30	2 (6.7%)	$P=0.109$	1	8 (26.7%)	$P=0.33$	1
	Overweight	33	7 (21.2%)		7.667 (0.72-81), 0.091	13 (39.4%)		3.367 (0.52-21.6), 0.201
	Obese	17	5 (29.4%)		6.875 (0.75-62.2), 0.086	8 (47.1%)		3.277 (0.64-16.6), 0.152
Exercise	Doing	23	8 (34.8%)	$P=0.019^*$	2.38 (0.5-10.3), 0.247	16 (28.1%)	$P=0.01^*$	2.26 (0.63-8.02), 0.206
	Not Doing	57	6 (10.5%)		1	13 (56.5%)		1
Blood Pressure	Normal	70	13 (18.6%)	$P=0.683$	0.25 (0.01-4.2), 0.334	26 (37.1%)	$P=0.74$	0.357 (0.05-2.5), 0.302
	High BP	10	1 (10%)		1	3 (30%)		1

\*Significant P value

a likely cause for this association. Wise *et al.* also reported a similar association between parity and knee OA.<sup>[16]</sup> Overweight and obese individuals were more likely to have positive result for knee OA. Pal *et al.* also found a statistically significant association between BMI and knee OA.<sup>[15]</sup> High BP is normally considered as a risk factor for OA of knee joint, but here an inverse relation was seen.

About 16.3% of the study participants were found to have osteoporosis and 61.2% had osteopenia. Kadam *et al.* reported similar findings with proportion of osteoporosis 18% when checked at the level of lumbar spine and 12.7% at the level of hip. However, the proportion of osteopenia was much less in that study (21.6% at lumbar spine level and 44.8% at hip level.)<sup>[17]</sup> In another study conducted on women >40 years of age, it was found that 8% had osteoporosis and 34% had osteopenia. Though this study also included younger participants, still the proportions are much higher than the previous study.<sup>[18]</sup>

The diseases, OA and osteoporosis, may have negative impact on routine activities of CHVs affecting both quantity as well as quality of the work that comprises of delivery of healthcare services at the grass-root level. CHVs, therefore, must be trained and sensitized about OA and osteoporosis and also educated about related issues such as weight reduction, exercise, and regular blood pressure monitoring. This study also calls for regular screening for peripheral health workers and adequate treatment for those who screen positive. Such studies may be repeated in similar as well as different study settings as such endeavours aid in raising awareness regarding such kinds of neglected noncommunicable diseases and may also help in detection of the latent cases.

## Conclusions

In this study, 17.5% CHVs screened positive for hip OA and 36.3% for knee OA. Advancing age, higher parity, and higher values for BMI were major determinants for both hip and

knee OA. Bone mineral densitometry showed that more than three-fourth of participants had low levels (61.2% osteopenia and 16.3% osteoporosis) and these problems were more severe as compared with previous studies. In summary, CHVs are at a high risk of developing problems, such as hip/knee OA and osteoporosis, in addition to other health problems, such as higher levels of BMI and blood pressure.

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## Conflicts of interest

There are no conflicts of interest.

## References

- Morvan J, Roux CH, Fautrel B, Rat AC, Euller-Ziegler L, Loeuille D, *et al.* A case-control study to assess sensitivity and specificity of a questionnaire for the detection of hip and knee osteoarthritis. *Arthritis Rheum* 2009;61:92-9.
- Di Bonaventura, Gupta S, McDonald M, Sadosky A. Evaluating the health and economic impact of osteoarthritis pain in the workforce: Results from the National Health and Wellness Survey. *BMC Musculoskelet Disord* 2011;12:83.
- Oxford Economics. The economic costs of arthritis for UK economy. Final Report 2010. Available from: <https://www.oxfordeconomics.com/publication/download/222531>. Last accessed on 2018 Sep 07].

4. Symmons D, Mathers C, Pflieger B. Global burden of Osteoarthritis in the year 2000. Global Burden of Disease 2000, Draft 15-08-06. Available from: [http://www.who.int/healthinfo/statistics/bod\\_osteoarthritis.pdf](http://www.who.int/healthinfo/statistics/bod_osteoarthritis.pdf). Last accessed on 2018 Sep 07].
5. Marshall D, Johnell O, Wedell H. Meta-analysis of how well measures of bone mineral density predict occurrence of osteoporotic fractures. *BMJ* 1996;312:1254-9.
6. Khadilkar AV, Mandlik RM. Epidemiology and treatment of osteoporosis in women: An Indian perspective. *Int J Women's Health* 2015;7:841-50.
7. Azad CS, Singh AK, Pandey P, Singh M, Chaudhary P, Tia N, *et al.* Osteoarthritis in India: An epidemiologic aspect. *Int J Recent Scientific Res* 2017;8:20918-22.
8. World Health Organization. Obesity: Preventing and Managing the Global Epidemic. WHO technical series 894. Geneva; 2000. Available from: [http://www.who.int/nutrition/publications/obesity/WHO\\_TRS\\_894/en/](http://www.who.int/nutrition/publications/obesity/WHO_TRS_894/en/). Last accessed on 2018 Sep 06].
9. US department of health and human services, National Institutes of Health, National heart, lung and blood institute. The seventh report of JNC on prevention, detection, evaluation and treatment of high Blood Pressure. NIH Publication No. 03-5233, December-2003. Last accessed on 2018 Sep 01]. Available from: <https://www.nhlbi.nih.gov/files/docs/guidelines/jnc7full.pdf>.
10. World Health Organization. Assessment of fracture risk and its application to screening for post menopausal osteoporosis: Report of a WHO study group. WHO technical series 843. Geneva; 1994. Available from: <http://apps.who.int/iris/handle/10665/39142>. [Last accessed on 2018 Sep 01].
11. Wittenauer R, Smith L, Aden K. Background Paper 6.12 Osteoarthritis. Priority Medicines for Europe and the World "A Public Health Approach to Innovation" Update on 2004 background paper, January 28<sup>th</sup> 2013. World Health Organization. Available from: [https://www.who.int/medicines/areas/priority\\_medicines/BP6\\_12Osteo.pdf](https://www.who.int/medicines/areas/priority_medicines/BP6_12Osteo.pdf). Last accessed on 2019 Apr 05].
12. Varthakavi PK, Joshi AS, Bhagwat NM, Chadha MD. Osteoporosis treatment in India: Call for action. *Indian J Endocrinol Metab* 2014;18:441-2.
13. Jotanovic Z, Mihelic R, Gulan G, Sestan B, Dembic Z. Osteoarthritis of the hip: An overview. *Periodicum Biologorum* 2015;117:95-108.
14. Sharma MK, Swami HM, Bhatia V, Verma A, Bhatia SPS, Kaur G. An epidemiological study of correlates of osteo-arthritis in geriatric population of UT Chandigarh. *Indian J Community Med* 2007;32:77-8.
15. Pal CP, Singh P, Chaturvedi S, Pruthi KK, Vij A. Epidemiology of knee osteoarthritis in India and related factors. *Indian J Orthop* 2016;50:518-22.
16. Wise BL, Niu J, Zhang Y, Felson D, Bradley LA, Segal N, *et al.* The association of parity with osteoarthritis and knee replacement in the multicenter osteoarthritis study. *Osteoarthritis Cartilage* 2013;21:1849-54.
17. Kadam NS, Chiplonkar SA, Khadilkar AV, Khadilkar VV. Prevalence of osteoporosis in apparently healthy adults above 40 years of age in Pune city, India. *Indian J Endocr Metab* 2018;22:67-73.
18. Gandhi AB, Shukla AKR. Evaluation of BMD of women above 40 years of age. *J Obstet Gynecol India* 2005;55:265-7.