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Prevalence and risk factors for work-related musculoskeletal disorder among female domestic workers employed in private homes in South India: A cross-sectional study

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ABSTRACT

Objectives: Musculoskeletal disorders (MSDs) are the most common occupational health problem accounting for a larger number of compensation days and disability among workers. An invisible workforce of female domestic workers (FDWs) is involved in back-breaking jobs in the informal job sectors, and yet, there are no studies to quantify their work-related MSD's (WMSDs). The objective of the study is to determine the prevalence of WMSDs among FDWs employed at private houses in Bengaluru, South India.

Material and Methods: A cross-sectional study was conducted among 408 randomly selected FDWs with a comparative group. The trained interviewer assessed WMSDs using a standardized Nordic Musculoskeletal questionnaire and psychosocial distress using the general health questionnaire–12.

Results: A high prevalence of WMSD was reported in the neck (19.6%), shoulder (23.8%), elbow (12%), upper back (31.9%), and ankle (26%) in domestic workers than the non-domestic workers. Age above 37 years (AOR: 1.77, 95% CI: 1.03–3.06), house cleaning ([>1715 h/year – AOR: 1.30, 95% CI: 0.60–2.84] [1714–555 h/year – AOR: 1.30, 95% CI:0.66–2.59]), and clothing ([Care >1460 h/year – AOR: 2.44, 95% CI: 1.12–5.35] [109–1459 h/year – AOR: 1.98, 95% CI: 0.95–4.10]) were factors associated with neck pain in FDW. Moreover, work experience of more than 10 years (AOR: 2.10, 95% CI: 1.32–3.34) and distress (AOR: 2.13, 95% CI: 1.25–3.61) was a factor associated with lower back pain in FDW.

Conclusion: FDWs are substantially affected by WMSDs in the neck and lower back due to house cleaning and clothing care tasks performed in the workplace setting, respectively.

Keywords: Female domestic worker, Work-related musculoskeletal disorders, Psychosocial distress

INTRODUCTION

Female domestic workers (FDWs) are a substantial group of the informal working population employed in a "hidden" nature of work in private homes.[1] In 2010, the International Labour Organization (ILO) estimated that 52,000,000 women and adolescent girls are employed as live-in or live-out domestic workers in private houses. In addition, the National Sample Survey Organization has reported that 4,200,000 women residing in urban slums were employed as domestic workers during 2004–2005 in private homes.[2]

FDWs remain outside the region of policy-making on social and labor issues and have been largely restricted to the informal economy. These women are unreached by any conventional policies as they work behind the closed doors of private households and are shielded from public view and attention.[3] This "urban women's workforce" faces several health issues not only in their homes but also at their workplaces.[4]

Studies have shown that poor living conditions, lack of basic facilities, and stress influence the physical health of women leading to poor appetite, lack of sleep, increased blood pressure, and fatigue. Domestic workers are involved in monotonous, repetitive, and backbreaking tasks by performing household chores as a worker in their homes as well as in private homes.[5,6] These factors increase their hardships by paving the way to adverse health and crisis in their reproductive health, which is economically crippling. In the case of chronic illness, these workers not only bear the burden of their medical treatment costs but also fall into job insecurity.[7,8] Studies have reported that women's general health and well-being are often not perceived as a high

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priority by either the women themselves or their families. Fear of job security also prevents reporting of work-related illness or injury to the employer.[9]

A systematic review of the health of FDWs provides substantial evidence that the musculoskeletal strain and pain experienced by domestic workers were due to tasks such as lifting heavy objects or caring for elderly persons.[10] There are scarce data on the work-related musculoskeletal disorders (WMSDs) of this marginalized group in workplaces. Hence, the objective of the study is to determine the prevalence of WMSDs when compared with non-domestic workers residing in urban slums of Bengaluru, South India.

MATERIALS AND METHODS

Study design

A cross-sectional study with a comparison group was designed with the consultation of an occupational physician. Information was collected through questionnaires administered by a trained interviewer.

Study area

The study was conducted in the urban slums of Bengaluru city. Karnataka Domestic Worker Union (KDWU) registers domestic workers working in Bengaluru city and the study's sampling frame was taken from the union list.

Sample size

The sample size was calculated based on a Bihari *et al*. study[11] among women in the general population with a prevalence of musculoskeletal pain that was 31.3%, and assuming the prevalence of musculoskeletal pain among domestic workers to be 41%, the estimated sample size for two-sample comparison of proportions was calculated as 376 in STATA (version 11). With a 10% non-response rate, a sample size of 415 participants in each group was planned to be recruited for the study.

Selection of study participants

From the sampling frame of 3693 registered FDWs, 415 domestic workers were randomly selected based on the eligibility criteria of the study using SSPS (version 21). Eligibility criteria for FDWs were FDWs above 18 years of age and with more than 1 year of work experience as a domestic worker based on the ILO definition. The comparative group, non-domestic workers above 18 years of age, was neighbors of the domestic workers and had never worked as a domestic worker in the past for income purposes. The study excluded domestic and non-domestic workers below 18 years of age and pregnant women.

Study tool

A data form was designed to collect the demographic details, occupational history, and domestic tasks performed (potential risk factors) among the study participants.

A standardized Nordic Musculoskeletal Questionnaire was used to determine the prevalence of MSDs (test-retest reliability of 77% and validity of 80%) among the study participants. The Nordic musculoskeletal questionnaire assesses the occurrence of MSDs in the study participants over a recent 12 month period, during the previous 7 days, as well as on the severity.[12] The study participants were shown the body map and were asked to specify symptoms of MSD at nine sites namely neck, shoulders, upper back, elbows, low back, wrist, hips, knees, and ankles. Then they were asked if they had any musculoskeletal trouble over the past 12 months. If the study participant reported yes, then they were further asked if they had pain in the previous 7 days and if they had visited a doctor for treatment.

Psychosocial distress was assessed using the General Health Questionnaire – 12 (GHQ-12) among both study participants. Its reliability coefficients range from 0.78 to 0.95.[13] The GHQ-12 questionnaire contains 12 questions and each question has four choice range from 0 (better than normal) to 3 (much less than normal). The scores are summed to get a total score ranging from 0 to 32, <12 is no distress, and more than 12 is mild to severe distress.

The data form and questionnaires were translated and back-translated into the Kannada language and were piloted. An average time of 20–25 min was taken to complete each interview session.

Training interviewer for data collection

Field health workers (female) were recruited for data collection and were trained using "health workers training guidelines" for 4 days.[14] The training focused on imparting knowledge about the questionnaires, developing skills to administer the questionnaire, ethics to be followed while receiving information from the participants, preserving the confidentiality of the data received, methods (e.g., by asking examples or illustrating the instance) to recognize if the participants are over-estimating their WMSD and for adequate practice administering the questionnaire before the study. To avoid interviewer bias, the objective of the study was concealed to the field health worker during training and during the data collection process. However, information about the study participant's occupation was unconcealed.

Ethical considerations

Informed consent was taken after duly explaining the study's benefits to the participants and the possible risks involved in

the study. The study's protocol and ethics were approved by the Institutional Review Board (IRB) of Christian Medical College, Vellore (IRB min no: 8979).

Statistical analysis

The data collected were entered into Epi data (version 3.1) and exported to SPSS (version 21) for analysis. Mean and standard deviation (SD) was estimated for continuous variable and frequency for categorical variables. The prevalence of WMSDs was calculated based on the scoring system of the questionnaires and the odds ratio (OR) (95% CI) was estimated between both the groups. The association between the outcome variables and independent variables was analyzed using univariate logistic regression with an unadjusted OR at 95% C.I for pain in 12 months for all joints. A multivariate analysis was done with significant independent factors associated with WMSD among domestic workers for pain in 12 months for neck and lower back pain.

RESULTS

A total of 408 domestic workers consented to participate in the study with a response rate of 98.3%. Fear of the employer at the workplace restricted seven domestic workers from participating in the study. A comparative group of 408 non-domestic workers was recruited from neighborhoods of domestic workers.

Most of the study participants were from the working population age group of 25–45 years, 172 (66.4%) domestic workers, and 201 (49.2%) non-domestic. More than 61% (251) of domestic workers obtained an education of 5 or <5 years. The mean (SD) years of education attended were 4.19 (4.12) years in domestic workers and 5.65 (4.53) years in non-domestic workers. The mean (SD) family income of domestic workers was Rs. 7828.19 (2519.7)/month and for non-domestic workers was Rs.7245.10 (2441.5)/month. However, <5% (20) of the domestic worker's families had an income of <Rs. 5000/month [Table 1]. Mean (SD) years of service of domestic workers were 10.77 (8.58) years [Table 2] and mean (SD) working hours were 6.12 (1.99) h. More than 86% (353) of domestic workers worked all 7 days a week without rest. Nearly, 50% (201) of domestic workers worked in more than three houses per day [Table 2].

Based on the ILO classification, domestic tasks performed by the study participant were grouped into five tasks, namely, house cleaning, kitchen cleaning, housekeeping, clothing care, and handling chemicals.[15] House cleaning tasks involved activities such as dusting the roof, sweeping the floor, dusting windows, cleaning carpets, and cleaning pets. The mean (SD) hours spent per year on house cleaning tasks was 1266.1 (1021.2) by domestic workers and 251.6 (284.2) by non-domestic workers. Kitchen cleaning tasks involved activities such as cleaning the kitchen, cleaning the stove, cleaning the fridge, and washing dishes. Mean (SD) hours per year in kitchen cleaning tasks performed by domestic workers were 2166.1 (1825.0) and non-domestic workers were 483.8 (185.1) in [Table 3].

Psychosocial distress was reported in 89 (21.8%) and 94 (23%) of domestic and non-domestic workers, respectively. The mean (SD) was 10.83 (5.38) for domestic workers and 9.30 (6.45) for non-domestic workers [Table 1].

Table 1: Sociodemographic profile of study participants.

Variable	Categories	Domestic Workers (*n*=408) *n* (%)	Non-Domestic Workers (*n*=408) *n* (%)
Age (years)	18–25	77 (18.9)	104 (25.5)
	26–35	138 (33.8)	116 (28.4)
	36–45	133 (32.6)	85 (20.8)
	46–55	40 (9.8)	62 (15.2)
	56–65	18 (4.4)	30 (7.4)
	66+	2 (0.5)	11 (2.7)
	Mean (SD)	35.94 (10.52)	36.68 (13.67)
Education (years)	≤5	251 (61.5)	187 (45.8)
	6–10	151 (37)	190 (46.6)
	11–15	6 (1.5)	31 (7.6)
	Mean (SD)	4.19 (4.12)	5.65 (4.53)
Marital status	Unmarried	30 (7.4)	20 (4.9)
	Married	338 (82.8)	353 (86.5)
	Widow	39 (9.6)	34 (8.3)
	Divorced	1 (0.2)	1 (0.2)
Family income/month	Mean (SD)	RS. 7828.19 (2519.7)	RS. 7245.10 (2441.5)
GHQ-12 score	Normal (0–12)	319 (78.2)	314 (77)
	Distress (13–36)	89 (21.8)	94 (23)
	Mean (SD) score	10.83 (5.38)	9.30 (6.45)

Self-reported neck pain over 12 months was reported among 80 (19.6%) domestic workers and 44 (10.8%) non-domestic workers. The domestic workers had twice higher odds of getting neck pain as compared to the non-domestic worker (OR = 2.0, 95% CI 1.4–3.0). Moreover, 97 (23.8%) domestic workers reported shoulder pain over 12 month periods and compared to the non-domestic worker they had a 1.6 times higher risk (OR = 1.6, 95% CI 1.1–2.2). Elbow pain over 12 months in domestic workers was reported among 49 (12%), which is 2.4 times higher than the risk of getting elbow pain in non-domestic workers (OR = 2.4, 95% CI 1.4–4.0). Upper back pain and ankle pain over 12 months was 1.5 (OR = 1.5, 95% CI 1.1–2.1) and 2.1(OR = 2.1, 95% CI 1.5–3.0) times higher in the domestic worker than the non-domestic worker, respectively. These differences were statistically significant at $P < 0.05$. Wrist pain had a reportable risk but was not statistically significant at <0.05. Lower back pain and knee pain were significant at <0.1. Pain in the hip was higher in non-domestic workers than in domestic workers [Table 4].

Further, analysis was done to find the risk factors associated with WMSDs among domestic workers. Pain in the neck (OR 1.7, 95% CI 1.0–2.8), shoulder (OR 3.6, 95% CI 2.2–5.9), elbow (OR 2.1, 95% CI 1.1–4.0), upper back (OR 2.2, 95% CI 1.4–3.3), lower back (OR 2.2, 95% CI 1.4–3.5), knee (OR 5.4, 95% CI 3.5–8.5), and ankle (OR 1.7, 95% CI 1.1–2.7) were significantly ($P = 0.05$) at a greater risk for more than 10 years of service among FDW's. Significant high risk in the neck (OR 1.9, 95% CI 1.2–3.1), shoulder (OR 1.8, 95% CI 1.2–3.0), and upper back (OR 1.5, 95% CI 1.0–2.3) were reported among domestic workers with more than 36 years of age than the younger age of 18–35 years [Table 5].

A multivariate binary logistic regression was performed to assess the effect of age, years of service, psychosocial distress, hours per year of house cleaning, and clothing care tasks among domestic workers with neck pain and lower back pain. In multivariate analysis [Table 6], domestic workers who were involved in the clothing care task for more than 1460 h/year had more than 2.4 times the risk to develop neck pain than domestic workers involved for <108 h/year (Adjusted OR 2.4 CI% 1.1–5.4). Similarly, domestic workers involved in clothing care for 1459–109 h/year had twice the risk of developing neck pain compared to the workers involved <108 h/year (Adjusted OR 2.0 CI% 1.0–4.1). Domestic workers with lower back pain [Table 7] reported distress of 2.13 times significantly higher than domestic without lower back pain (Adjusted OR 2.1 CI% 1.3–3.6). These were all statistically significant at $P < 0.05$.

Table 2: Work profile of domestic workers (*n*=408).

Variable	Categories	Domestic Workers (*n*=408) *n* (%)
Years of service	1–5 years	140 (34.4)
	6–10 years	123 (30.1)
	11–15 years	51 (12.5)
	16–20 years	51 (12.5)
	21–25 years	18 (4.4)
	26–30 years	13 (3.2)
	31–35 years	8 (2)
	>36 years	4 (1)
	Mean (SD)	10.77 (8.58)
Working hours per day	<5 h/day	147 (36.03)
	6–8 h/day	240 (58.82)
	9–12 h/day	21 (5.15)
	Mean (SD)	6.12 (1.99)
Number of days worked/week	All 7 days	353 (86.52)
	<7 days	55 (13.48)
Number of houses worked/day	≤2 h/day	198 (48.5)
	3–5 h/day	201 (49.3)
	>6 h/day	9 (2.2)
	Mean (SD)	2.67 (1.23)
Salary/day	≤150 Rs.	39 (9.5)
	151–250 Rs.	177 (43.4)
	251–350 Rs.	178 (43.6)
	351–450 Rs.	14 (3.4)
	Mean (SD)	251.95 (70.1)

DISCUSSION

Domestic workers' job involves cleaning, cooking, and caring for children and the elderly at their employer's home. Each type of task has its inherent risks and exposure factors that influence the musculoskeletal and reproductive health of the worker. To date, minuscule data are available on the WMSD among FDWs employed in private houses.[16] Our study was

Table 3: Type of domestic tasks performed by the study participants.

Types of domestic work	Domestic Workers (*n*=408)		Non-Domestic Workers (*n*=408)	
	n (%)	Mean (SD) h/year	*n* (%)	Mean (SD) h/year
House cleaning tasks	407 (99.7)	1266.1 (1021.2)	400 (98)	251.6 (284.2)
Kitchen cleaning tasks	400 (98)	2166.1 (1825.0)	403 (98.8)	483.8 (185.1)
House-keeping tasks	405 (99.3)	1620.7 (1280.4)	398 (97.5)	275.4 (177.1)
Clothing care	312 (76.5)	951.6 (1201.8)	380 (93.1)	299.6 (206.1)
Handling chemicals	374 (91.7)	1099.5 (1303.1)	366 (89.7)	131.0 (164.0)

Table 4: The prevalence of musculoskeletal pain for 12 months reported by the study participants.

Nordic Questionnaire	Domestic Worker (*n*=408) *n* (%)	Non-Domestic Worker (*n*=408) *n* (%)	Odds Ratio (CI 95%)
Neck	80 (19.6)	44 (10.8)	2.0 (1.4–3.0)*
Shoulder	97 (23.8)	67 (16.4)	1.6 (1.1–2.2)*
Elbow	49 (12)	22 (5.4)	2.4 (1.4–4.0)*
Wrist	77 (18.9)	61 (15)	1.3 (0.9–1.9)
Upper Back	130 (31.9)	95 (23.3)	1.5 (1.1–2.1)*
Lower Back	112 (27.5)	91 (22.3)	1.3 (1.0–1.8)
Hip/thigh	50 (12.3)	54 (13.2)	0.9 (0.6–1.4)
Knee	156 (38.2)	133 (32.6)	1.3 (1.0–1.7)
Ankle	106 (26)	59 (14.5)	2.1 (1.5–3.0)*

*Indicates statistical significance association

Table 5: Univariate logistic regression analysis to examine the association between risk factors and musculoskeletal disorders in the past 12 months.

Variable	Category	Neck Pain	Shoulder Pain	Elbow Pain	Upper Back Pain	Lower Back Pain	Knee Pain	Ankle Pain
Age	≥36 years	1.9 (1.2–3.1)*	1.8 (1.2–3.0)*		1.5 (1.0–2.3)*		2.6 (1.7–3.9)*	
Years of service	>10 years	1.7 (1.0–2.8)*	3.6 (2.2–5.9)*	2.1 (1.1–4.0)*	2.2 (1.4–3.3)*	2.2 (1.4–3.5)*	5.4 (3.5–8.5)*	1.7 (1.1–2.7)*
GHQ-12 score	Distress (>13)					1.8 (1.1–3.0)*		
House cleaning	>1715 h/year			3.2 (1.3–7.8)*				
	1714–555 h/year							
	<545 h/year							
House keeping	>2190 h/year		1.8 (1.0–3.1)*	2.7 (1.3–5.8)*				1.9 (1.1–3.4)*
	2189–731 h/year							
	<730 h/year							
Clothing	>1460 h/year	3.0 (1.4–6.3)*				2.2 (1.2–4.1)*		
	1459–109 h/year	2.1 (1.0–4.3)*						
	<108 h/year							

*Indicates statistical significance association

Table 6: Multivariate analysis to examine association between neck pain and risk factors affecting female domestic workers.

Variable in the model	B	S.E.	Adjusted Odds ratio (95% C.I)
Age ≤37 years	0.57	0.28	1.77 (1.03–3.06)*
Years of service >10 years	0.26	0.28	1.30 (0.75–2.24)
GHQ-12 - Distress (>13)	–0.57	0.35	0.57 (0.28–1.13)
House cleaning >1715 h/year	0.27	0.40	1.30 (0.60–2.84)*
House cleaning 1714–555 h/year	0.26	0.35	1.30 (0.66–2.59)*
Clothing care > 1460 h/year	0.89	0.40	2.44 (1.12–5.35)*
Clothing care 109–1459 h/year	0.68	0.37	1.98 (0.95–4.10)*

*Indicates statistical significance association

Table 7: Multivariate analysis to examine the association between lower back pain and risk factors affecting female domestic workers.

Variable in the model	B	S.E.	Adjusted Odds ratio (95% C.I)
Years of service >10 years	0.74	0.24	2.10 (1.32–3.34)*
GHQ-12 - Distress (>13)	0.76	0.27	2.13 (1.25–3.61)*
House cleaning >1715 h/year	0.24	0.44	1.27 (0.54–3.02)
House cleaning 1714–555 h/year	0.36	0.35	1.43 (0.72–2.85)
Housekeeping >2190 h/year	0.26	0.37	1.30 (0.63–2.71)
Housekeeping 2189–731 h/year	–0.22	0.33	0.80 (0.42–1.54)
Clothing care >1460 h/year	0.61	0.34	1.85 (0.95–3.61)
Clothing care 109–1459 h/year	0.43	0.31	1.54 (0.84–2.82)

*Indicates statistical significance association

the first of its kind in our country to assess the WMSD issue among an informal group of employees.

Both domestic and non-domestic workers were of a comparable age group with a median age of 35.94 years and

36.68 years, respectively. More than 65% of the domestic worker belonged to the working population age group between 25 and 45 years. More than 60% of the domestic workers had an education <5 years, implying that women with low education take up jobs like domestic workers in urban cities. The most interesting fact is that more than 50% of our domestic workers' family incomes were above Rs. 10,000 and it should be attributed to the contribution made by the domestic worker toward the economic growth of their family.

The housekeeping and kitchen cleaning tasks were the most repetitive tasks performed by the study participants. The median hours spent on performing house cleaning tasks were 936 h/year, kitchen cleaning tasks were 1709 h/year, housekeeping tasks were 1338 h/year, clothing care were 730 h/year, and handling chemicals were 730 h/year. These results are in parallel to the occupational history data collected by Medina-Ramo *et al*. 2003 in her study, which was reported in times per year.[17]

A higher prevalence of WMSD's was reported as knee pain (38.2%), upper back pain (31.9%), lower back pain (27.5%), ankle pain (26%), shoulder pain (23.8%), and neck pain (19.6%) in domestic workers. This can be ascribed to the repetitive nature of movements performed, while doing domestic tasks at home and work such as sweeping the floor, dusting the roof, mopping the floor, and washing the clothes using both hands. In 2009, a qualitative study by Ahonen *et al*. reported more frequent muscle strain and back pain in FDW.[18] A systematic review of the health of FDWs has attributed to the nature of work performed by the domestic worker and its association with WMSDs. In the review, musculoskeletal strain and pain were experienced by domestic workers due to tasks such as lifting heavy objects or taking care of elderly persons.[10] However, age, gender, and physical work conditions may have a confounding effect on WMSDs.[19]

In 2011, Bihari *et al*. studied musculoskeletal pain among women aged 10–70 years in the general population in the villages of the National Capital Region, India. These women were involved in agriculture, dairy work, labor, and those involved in household chores. Our study participants had a higher prevalence of WMSDs compared to that of women in the general population.[11] Similarly, the prevalence of lower back pain among Dutch women was more or less parallel to our study group.[20]

FWDs with more than 36 years of age and more than 10 years of service had a positive association with almost all joint pains in the univariate logistic regression analysis. This substantiates other work of the literature published on the degeneration of physical function, where workers above 45 years of age and more years of exposure to repetitive ergonomic hazards have a higher risk of WMSDs.[9] Increased hours of involvement in house cleaning (Adjusted OR 1.3 CI% 0.6–2.8) and clothing care (Adjusted OR 2.4 CI% 1.1–5.4) tasks had a significantly higher risk of association with neck pain after adjusting for the effect of age and years of service among domestic workers. This can be attributed to the monotonous repetitive nature of work at home and workplace performing overhead activities with the neck and shoulder and also maintaining the head in an upward position to clean the ceiling.

Similar to other studies such as Akrouf *et al*. 2010, our study has also reported a significant association between low back pain and psychosocial stress among domestic workers.[21] This can be due to the combination of high demanding jobs (poor work pace and increased time pressure) and low job control among domestic workers.[22] The other possible reasons could be the intimidating working environment, job insecurity, prolonged working hours, and extra working hours in more private homes by a domestic worker.[23-25]

Limitations

The cross-sectional design is one of the limitations of the study as the association between risk factors and occupational exposure is unclear. This could have been emphasized using a case–control or cohort study design. Our study did not focus on the economical postures and positions adopted while performing work by the study participants in their workplace settings. Future studies could focus on the above as well as on the necessary precautions to be taken in workplace settings, along with instructions to the domestic workers and the employer.

CONCLUSION

Neck and lower back pain were significantly due to house cleaning and clothing care tasks, respectively. These tasks need to be performed with the necessary adaptation and precautions in a workplace setting. A better understanding of the FDW's WMSDs can help bring awareness and be a source of information for employers, policymakers, and government officials to encourage the implementation of social security schemes for FDWs in the future.

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Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Conflicts of interest

There are no conflicts of interest.

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