

Study of Morbidity Pattern Among Salt Workers in Marakkanam, Tamil Nadu, India

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ABSTRACT

Background: Salt workers are exposed to occupational hazards like contact with salt crystals and brine, physical stress, sunlight and glare due to sunlight reflected by salt crystals. Very few studies have documented the morbidity among the salt workers.

Aim: To assess the morbidity pattern among salt workers in Marakkanam, Tamil Nadu, India.

Materials and Methods: A community based cross-sectional study was undertaken in 4 randomly selected salt worker villages. Three hundred thirty one salt workers were reached by a house-to-house survey during April 2010 to March 2011. Demographic data was collected; clinical examination was conducted using a predesigned and pretested questionnaire. A pilot study was conducted to estimate the prevalence of morbidity before initiating the study. The data was analyzed using SPSS Version 11.5. Chi-square test and odds ratios (OR)

with 95% confidence intervals (CI) were calculated to determine the association of morbidity levels with various factors.

Results: Of the 331 salt workers in the study, 58% were females, mean age was 41.9 ± 10.8 y. Eighty seven percent salt workers had some or other morbidity. The observed morbidities include clinical pallor (44.4%), ocular morbidities including cataract, pterygium, conjunctivitis, pingecula and corneal ulcer (42%), caries teeth (41.7%), hypertension (23.3%), underweight (19.3%), goiter (19%), obesity (14.8%) and dermal conditions including dermatitis, thickening of palm and sole, tinea unguum, folliculitis (9.1%). The presence of morbidity did not show any significant association with increase in age, gender, duration of employment or the type of salt work involved with. However, the lower the education level, the higher is the morbidity level among salt workers (OR = 5.23, 95% CI= 2.07 to 13.21)

Conclusion: Morbidity among salt workers is high. Intervention programs are needed to alleviate the health problems in the salt workers.

Keywords: Musculoskeletal symptoms, Occupational hazards, Outdoor occupation, Work related illness

INTRODUCTION

Throughout the world, most adults spend much of their waking hours at work. Work provides a number of economic and other benefits. At the same time, people at work face a variety of hazards owing to chemicals, biological agents, physical factors, adverse ergonomic conditions, allergens, a complex network of safety risks, and many and varied psychosocial factors. WHO reports that each year an estimated 160 million new cases of work-related illness occur and takes 1.7 million lives, accounting for 3% of all deaths [1]. Also, the occupational risk factors account globally for a number of morbid conditions, including 37% back pain, 16% hearing loss, 13% chronic obstructive lung disease, 11% asthma, 10% injuries, 9% cancer, and 2% leukemia [2].

Marakkanam is one of the 22 community development blocks in Villupuram district of Tamil Nadu, around 130 kilometers south of Chennai. The major occupations are agriculture; fishing and salt production with salt pans spread over 2000 acres. Around 2000 salt workers reside in 10 permanent villages located adjacent to the salt pans.

The salt production in Marakkanam is by the traditional method of evaporation of brine (water with high concentration of salt) filled in the salt pans. The procedure is labour intensive with no modern equipments being used. At the start of the salt production, the salt workers are engaged in cleaning the silt and vegetations accumulated in the salt pans as a result of the previous rains, stamping the floor of the salt pan after sprinkling it with river sand to make it hard and smooth. The land is divided into squares of salt pans measuring 20-25 feet on its sides and is leveled with a slight slope towards one direction for the water to drain into successive pans. Once the salt pans are ready, the sea water is pumped into it.

The brine is collected into the first pan and kept for evaporation for three days. This concentrated brine is then let out into the second and subsequently into the third and fourth pans in the field. In the last pan where its concentration is high, sodium chloride separates into crystals. The crystals which separate are collected by wooden shovels with long handles. This process is called 'scrapping of salt'. The salt thus formed is then carried overhead in baskets and stored in a central place or platform till they become dry. Later, the workers fill the salts in gunny bags, weigh them and load them into trucks for transport. Despite the fact that salt workers were given priority as an occupational group in the National Occupational Health program [3], there is still paucity of epidemiological data on the health status of salt workers throughout India. So, the present study was conducted with objectives of assessing the morbidity pattern among the salt workers at Marakkanam, Tamil Nadu, India.

MATERIALS AND METHODS

A community-based, cross-sectional study was conducted from April 2010 to March 2011 at Marakkanam. The study included individuals employed in salt work for at least 2 years. As no estimates of the prevalence of morbidity among salt workers in the region was available in the literature, a pilot study was conducted in January 2010 to estimate the proportion of salt workers (person prevalence) suffering from one or more morbidity. The pilot study was conducted on 62 salt workers in Kaipenikuppam village. Of the 62 salt workers, 41 (66.13%) were found to be suffering from one or more morbid conditions. Thus, the person prevalence of morbidities was calculated to be 66.13%. Based on this prevalence, a sample size of 203 salt workers was calculated using the formula $n = Z^2 \cdot 1 - \alpha / 2 \cdot P (1-P) / e^2$ using a 95% confidence level and a relative precision of 10%. Four Villages were randomly selected from the other 9 villages.

These villages were inhabited by the salt workers and homogenous in nature. A house to house survey was conducted to enlist the eligible salt workers, i.e. employed in salt work for two years or more. Of the total 389 eligible salt workers in these four villages, 331 workers who were available participated in the study were included. The purpose of the study was explained and an informed written consent was taken before enrolling the respondents. The data collection was done using a pre designed and pre tested questionnaire. The data was compiled, analyzed and tabulated using SPSS Version 11.5. To compare data sets, chi-square test was applied to assess strength of association of variables, odds ratios (OR) with 95% confidence intervals (CI) were calculated.

RESULTS

Out of the total 331 salt workers interviewed in the study 140 (42.3%) were males and 191 (57.7%) females. The mean age was 41.9 ± 10.8 y (Males 44.3 ± 11.9 y, Females 40.2 ± 9.5 y). The mean duration of employment was 17.4 ± 7.5 y. Musculoskeletal symptoms were the highest reported morbidity among the salt workers (62%). These were more reported by females (75%) as compared to males (44%). It was observed that 87% of salt workers had some morbidity or the other, with only 13% with no apparent morbidity. The morbidities observed were clinical pallor (44.4%), ocular morbidities including cataract, pterygium, conjunctivitis, pingecula and corneal ulcer (42%), caries teeth (41.7%), hypertension (23.3%), underweight (19.3%), goiter (19%), obesity (14.8%) and dermal conditions including dermatitis, thickening of palm and sole, tinea unguum, folliculitis (9.1%). Among males, the morbidities observed in decreasing order were caries teeth, ocular morbidities, hypertension, anaemia and dermal conditions. Among females, common morbidities include anaemia, ocular morbidities, caries teeth, goiter, and hypertension [Table/Fig-1].

Using the Asian cut off for BMI [4], 19.3% were underweight (22.1% among males and 17.3% among females) and another 14.8% were found to be obese (11.4% males and 17.3% females). Of the 331 salt workers, 24 (7.3%) were known hypertensives. Another 53 (16%) were newly found to be hypertensive using a cut off of SBP ≥ 140 mm Hg and/or DBP ≥ 90 mm Hg as per JNC 7 criteria [5], bringing the overall prevalence of Hypertension to 23.3%. Thirty (9%) of the respondents were hospitalized in the last one year. Musculoskeletal morbidities, fever and diarrhea were the common reasons for hospitalization. The presence of morbidity did not show any significant association with increase in age, gender duration of employment or the type of salt work involved with. However, the lower the education level, the higher is the morbidity level among salt workers; illiterates had higher morbidity compared with those who were educated in high school (OR = 5.23, 95% CI= 2.07 to 13.21). The same pattern was seen when primary school educated salt workers were compared with high school educated (OR = 6, 95% CI= 2.13 to 16.90) [Table/Fig-2].

DISCUSSION

Assessment of the health status of salt workers has been one of the proposed areas of research priorities in the National programme for control and treatment of occupational diseases [3]. Despite this, it is evident from the review of literature that there are only few studies on the health status of salt workers. These studies, conducted in Gujarat and Rajasthan have documented that 17 to 85% of the salt workers suffer from one or more morbid conditions like musculoskeletal, ophthalmic, dermal and other morbidities at any given point in time [6-9]. However, these studies have been conducted on the salt workers who were invited to attend free medical camps held near salt pans; a representative sample was not selected probably because the salt workers were migrants living in temporary dwellings. The salt workers at Marakkanam were permanent dwellers of the villages and this study could get an adequate representation of 331 of total 389 salt workers living in four villages.

Morbidity	Gender		Total n = 331 (%)
	Male n = 140 (%)	Female n = 191 (%)	
Anaemia	39 (27.86)	108 (56.54)	147 (44.41)
Ocular			
Cataract	33 (23.57)	51 (26.70)	84 (25.38)
Pterygium	21 (15.00)	22 (11.52)	43 (12.99)
Conjunctivitis	4	3	7
Pingecula	2	1	3
Corneal ulcer	0	2	2
Total	60 (42.86)	79 (41.36)	139 (41.99)
Caries teeth	62 (44.29)	76 (39.79)	138 (41.69)
Hypertension	40 (28.57)	37 (19.37)	77 (23.26)
Underweight	31 (22.14)	33 (17.28)	64 (19.34)
Goitre	15 (10.71)	48 (25.13)	63 (19.03)
Obesity	16 (11.43)	33 (17.28)	49 (14.80)
Skin			
Dermatitis	10	3	13
Thickness of palm and sole	8	3	11
Tinea unguum	3	1	4
Folliculitis	1	0	1
Vitiligo	1	0	1
Total	23 (16.43)	7 (3.66)	30 (9.06)
Other Systems			
Clubbing	16 (11.43)	3 (1.57)	19 (5.74)
Tremor	6 (4.29)	2 (1.05)	8 (2.42)
Varicose veins	5 (3.57)	2 (1.05)	7 (2.11)
Icterus	3 (2.14)	3 (1.57)	6 (1.81)

[Table/Fig-1]: Morbidity pattern observed among salt workers, Marakkanam

Majority (87%) had some morbidity with only 13% with no apparent morbidity. The most reported morbidity was musculoskeletal complaints in this study. A number of studies have documented higher musculoskeletal morbidity among other occupations also, such as truck drivers, textile workers, fishermen and workers in outdoor occupations [10-14]. Female workers (75%) reported more musculoskeletal symptoms as compared to males (44%). Studies have documented that the female workers often suffer from musculoskeletal disorders because neither the tasks nor the equipment they use, which is normally designed for men, are adapted to their built and physiology [15]. Eyes of salt workers are continuously exposed to sunlight reflected by the surface of brine and by the crystals lying at the bottom of the pans, causing glare and irritation. This results in the high prevalence of ophthalmic complaints including glare, burning of eyes, dimness of vision, watering of eyes. The present study shows a lower prevalence of ocular morbidities (42%) as compared to 61% in the salt workers attending medical camps in Rajasthan [7]. Outdoor occupation has been reported as a risk factor for ophthalmic conditions like cataract, pterygium [16,17]. Only 4% of salt workers in the present study as against 44% in Rajasthan had dermatological problems [7]. This may be due to environmental factors wherein the personal hygiene of the workers may be adversely affected due to inadequate water supply as well as the higher intensity of sunlight in desert areas of Rajasthan as compared to the coastal areas of the present study. The prevalence of hypertension in the present study is 23% among the salt workers as compared to 7% prevalence in brine workers of Rajasthan [9]. This difference may be due to use of unconventional PPEs among salt workers in Rajasthan to prevent contact with brine as revealed by a KAP study on the same study population of salt workers [18]. The Government of India, through its 'National Policy on Safety, Health and Environment at work place', states that "Government is committed to regulate all economic activities for management of safety and health risks at workplaces and to provide measures so

Characteristic		Total (n=331)	Morbidity present	Morbidity absent	Odds ratio	p-value
Age (years)	20-39	144	116 (80.6)	28 (19.4)	1	0.10
	>=40	187	163 (87.2)	24 (12.8)	1.64 (0.90-2.97)	
Sex	Male	140	112 (80.0)	28 (20.0)	1	0.07
	Female	191	167 (87.4)	24 (12.6)	1.74(0.96-3.16)	
Education	High school	23	12 (52.2)	11 (47.8)	1	-
	Middle	64	42 (65.6)	22 (34.4)	1.60 (0.61-4.19)	0.25
	Primary	83	72 (86.8)	11 (13.2)	6.00 (2.13-16.90)	<0.05
	Illiterate	161	137 (85.1)	24 (14.9)	5.23 (2.07-13.21)	<0.05
Duration of work (years)	<=10	114	92 (80.7)	22 (19.3)	1	-
	11-20	115	100 (87.0)	15 (13.0)	1.59 (0.78-3.26)	0.20
	21-30	79	67 (84.8)	12 (15.2)	1.34 (0.62-2.89)	0.46
	>30	23	20 (87.0)	3 (13.0)	1.59 (0.43-5.85)	0.48
Type of work	More than one type work	143	122 (85.3)	21 (14.7)	1	-
	Preparation of salt bed	107	89 (83.2)	18 (16.8)	0.85 (0.43-1.69)	0.64
	Scrapping of salt crystals	33	27 (81.8)	6 (18.2)	0.77 (0.29-2.10)	0.62
	Collection and loading of salt	48	41 (85.4)	7 (14.6)	1.01 (0.40-2.54)	0.98

[Table/Fig-2]: Association of Socio-demographic and work related characteristics with Morbidity

as to ensure safe and healthy working conditions for every working man and woman in the nation" [19]. There is a dearth of studies documenting the health status of the salt workers as evidenced by the availability of very few studies on the subject. Further studies are needed to document their health status and methods for prevention of these morbidities.

CONCLUSION

Working in salt industry exposes the working population to direct contact with inhalable salt dust, salt crystals as well as concentrated brine, physical stress of hard manual labour, direct bright sunlight and glare due to sunlight reflected by salt crystals and brine surface. However, the extreme weather and hard labour conditions in the salt pans cause lot of morbidities among the salt workers. There is a need for modernization and mechanization of salt works and use of personal protective equipments to overcome this problem.

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