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IMPACT OF SOCIO-ECONOMIC STATUS OF SALT PAN WORKERS IN TUTICORIN DISTRICT, TAMIL NADU

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ABSTRACT

Studies on impact of socio-economic status of salt pan workers in tuticorin district, Tamil Nadu was carried out during year 2024. Salt pan workers in Tuticorin district extract and refine salt from seawater, a labour-intensive occupation involving manual harvesting under harsh conditions. These workers, often from socioeconomically disadvantaged backgrounds, face challenges like inadequate pay and occupational health risks. Workers in the regional economy, despite their significant contribution, often face limited access to essential services and face socio-economic challenges. The study explored the socio-economic conditions, occupational health hazards, job quality, and security of salt pan workers in Tuticorin district. The research, based on a thorough survey and in-depth interviews with a representative sample of 180 from three villages i.e. Arumuganeri, Tharuvaikulam, and Muthiahpuram.

Even though, the salt industry contributed significantly to the regional economy, but the physical toll on workers remains substantial. Male workers, in particular, were frequently affected by chronic health problem during peak summer months. Seasonal unemployment during the winter and the scarcity of alternative job opportunities further exacerbated their socio-economic vulnerabilities. To mitigate these risks, workers often resort to self-initiated coping mechanisms such as the use of personal protective equipment (PPE), basic self-care routines, and scheduled rest periods. However, these strategies were often insufficient without systemic intervention. The study highlighted the urgent need for comprehensive modernization and mechanization of salt production processes. Emphasis was placed on implementing structured training programs, improving access to high-quality PPE, and ensuring consistent availability of essential amenities like clean drinking water, shade structures, and sanitation facilities at work sites. Nutritional security for workers and their families must be prioritized to enhance overall well-being. The study used a qualitative approach and statistical tools like simple percentage analysis, ANOVA, Chi-square, and MANOVA for data analysis. The analysis highlighted the urgent need for policy interventions to enhance health and safety standards, job security, and to improve the socio-economic status of salt pan workers in the study region. These included the deployment of mobile health clinics, distribution of free PPE, regular health awareness campaigns, and the introduction of seasonal employment guarantee schemes. Additional recommendations encompass vocational training, improve access to low-interest credit facilities, subsidize food supply, affordable housing initiatives, and gender-sensitive wage policies to address disparities. Women should be empowered by promoting entrepreneurship and providing funding support for small-scale businesses.These interventions collectively foster sustainable livelihood enhancement and occupational safety for salt pan workers in the Tuticorin district.

(Key words: Socio- economics, health hazards, salt pan, labour rights, workforce welfare, Personal Protective Equipment (PPE))

INTRODUCTION

Tuticorin District, India's salt industry is renowned for its dry climate and annual rainfall, sustaining salt production for 8-9 months. The region's salt pans, operating on leased lands, employ the highest number of salt workers in Tamil Nadu, contributing significantly to the state's salt output (Selvamani and Latha, 2017; Anonymous, 2020; Henry *et al.*,, 2021). Salt production in Tuticorin District leads to precarious livelihoods for salt pan workers due to seasonal employment, inadequate skills, limited social security access, and lack of awareness programs. Substandard living conditions, persistent poverty, and vulnerability, particularly among women, further exacerbate the situation. Salt pan workers face health hazards like sunlight exposure, high temperatures, and respiratory problems, necessitating increased daily water intake.

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Proactive measures are needed to address these issues (Soni and Rameshwar, 2021; Randy, 2023). Salt pan workers in Tuticorin District face severe health hazards due to harsh environmental conditions and work-related risks. Despite advancements in technology and machinery, they are facing health problems. Furthermore, the economic empowerment of women in agriculture through Self-Help Groups (SHGs) was noted by Rajalaxmi and Indra (2023) where they highlighted the potential of collective action and financial inclusion in uplifting marginalized women a perspective relevant to addressing the vulnerabilities of women communities. Their socio-economic situation is dire, especially during winter, with unpredictable job opportunities and low wages. There is a research gap on the long-term effects of these conditions on workers' well-being and economic stability (Agarwal and Chawla, 2021; Venugopal, 2023). With this backdrop, this study investigated the impact of socio-economic status, health hazards, and job security on the well-being of salt pan workers in Tuticorin district (TN).

MATERIALS AND METHODS

The study was carryout during year 2024 to assed the socio-economic status, occupational health hazards, and job quality of salt pan workers in Tuticorin District, focusing on three villages such as Arumuganeri, Tharuvaikulam, and Muthiahpuram. Because, these three areas have huge volume of salt production and employ more workers than other areas in the study district. The population of 51,647 workers, including 38,318 men and 13,329 women, are engaged in salt pan production in the study area. The study gathered data from 180 respondents using a stratified random sampling technique. The selection of respondents was also based on the different processes involved in salt production, namely pumping, racking, salt collection, salt bed casting and salt heaping.The study utilized statistical tools like simple percentage analysis, Regression, MANOVA, ANOVA, and Chi-Square tests to examine and validate the results of a study. The variables such as age, marital status, family members, income from other sources, savings, debt, sources of debt, and residential area were analyzed using the ANOVA test. Regression analysis was applied to variables like weekly expenditure and weekly income. Notably, multivariate analysis of variance (MANOVA) was used to examine dependent variables such as physical health problems, health challenges and physical hazards, seasonal variations, job insecurity, and the dissemination of information regarding government policies and social welfare programs. Additionally, the Chi-square test was employed to assess seasonal variations in job quality and security for salt pan workers, as well as the factors affecting job satisfaction and security in the salt pan industry.

RESULTS AND DISCUSSION

Table 1 shows the salt pan workers in Tuticorin district were predominantly male which constituted 57.8 per constituted 57.8 per cent and remaining 42.2 per cent were women. Among age groups, aged between 35-44 were registered highest in number which constituted 67.2 per cent and aged between 45-54 were lesser in number which constituted only less than one per cent to total sample population. 35-44, married, and residing in rural areas. They earn between Rs. 6001 and Rs. 8000, with 48.9 per cent earning between Rs. 6001 and Rs. 8000. Most workers had no savings, incurred high expenditures, and depended on moneylenders, worsening their economic vulnerability in the industry. Nagadong *et al*. (2024) found similar trends in income levels, landholding size, and family structure.

Table 2 portrays occupational hazards and physical problems faced by salt pan workers, including skin conditions, eye irritation, heat stress, dehydration, musculoskeletal injuries, and back pain. Physical health issues included hypertension, heart diseases, and dermatitis. Job quality and security were impacted by market uncertainty and limited skill development opportunities. Seasonal variations in job quality varied, with 40.0 per cent experiencing significant fluctuations based on salt production cycles. Ramaswamy and Anand (2017) opined that salt pan workers endure severe occupational and health hazards due to harsh working conditions, with minimal protection or support. They emphasized that poor job security, market volatility, and lack of skill development deepen the workers' vulnerability, especially during seasonal downturns in salt production.

Table 3 explains salt pan workers employ various strategies to manage seasonal variations and job insecurity, including skill development programs, alternative income sources, and government-provided safety nets. However, only 12.2 per cent used labour unions and worker associations for information and 14.4 per cent used digital platforms. Personal protective equipment and traditional self-care practices were common, but more support is needed to improve working conditions and well-being (Kannan and Devi, 2019).

Table 4 represents the association mean difference between the variables. The ANOVA results revealed significant differences in socio-economic and demographic variables among salt pan workers in Tuticorin district. Age was a significant factor, $F_{(1,178)} = 25.505$, $p = 0.001$, with older workers experienced different socio-economic conditions compared to younger workers. Marital status also showed a substantial effect, $F_{(1,178)} = 308.533$, $p = 0.001$, indicating that married workers faced different challenges compared to their unmarried workers. The number of family members significantly impacted workers' conditions, $F_{(1,178)} = 8.889$, $p = 0.003$, with larger families experiencing more socio-economic strain. Income from other sources was another significant variable, $F_{(1,178)} = 28.235$, $p = 0.001$, affecting workers' financial stability. Savings were notably different across groups, $F_{(1,178)} = 25.388$, $p = 0.001$, with those having less savings experiencing more financial instability. Debt levels showed a pronounced effect, $F_{(1,178)} = 383.726$, $p = 0.001$, and the sources of debt also varied

significantly, $F_{(1,178)} = 34.422$, $p = 0.001$. Finally, residential area was a significant determinant, $F_{(1,178)} = 47.467$, $p = 0.001$, indicating that urban and rural workers faced different challenges. Unique findings from the ANOVA resulted highlighting that marital status have the most substantial impact on the socio-economic conditions of salt pan workers, as evidenced by the highest F-value of 308.533. This suggests that married workers faced significantly different challenges compared to their unmarried counterparts. The impact of debt, with an F-value of 383.726, underscored the severe financial instability among workers with varying debt levels. Moreover, the substantial influence of residential area, indicated by an F-value of 47.467, pointed to the different challenges faced by urban and rural workers, necessitating specific measures. Sundararajan and Priya (2020) opined that socio-economic disparities among salt pan workers were deeply influenced by personal and demographic factors, with marital status and debt levels playing a critical role in shaping their financial vulnerability. They emphasized the need for targeted interventions based on family size, savings, and residential location to address the distinct challenges faced by different groups.

Testing of hypothesis

The multiple regression of the following model

$$Y = \hat{a}_0 + \hat{a}_1 X_1 + \hat{a}_2 X_2 + \ldots\ldots + \hat{a}_n X_n + e$$

Where, Y_i = Dependent Variable and X_i = Independent Variable was used to test the hypothesis given as under.

H_0: There is no relationship between weekly expenditure and weekly income.

H_1: There is a significant relationship between weekly expenditure and weekly income.

Table 5 examines the relationship between weekly income and weekly expenditure, revealing a strong positive correlation. The ANOVA method was used to determine the extent to which income levels influence expenditure patterns. The results show that 54.8 per cent of weekly expenditure variance can be explained by income, aligning with Keynes' psychological law of consumption. Salt pan workers tended to spend more as their income increases, but the increase in expenditure was less than the rate of income increase (Rajendran and Kumari, 2019).

Table 6 represents the gender perception in dependent variables. The analysis of gender differences among salt pan workers reveals significant disparities in various health and occupational parameters. Male workers reported a mean score of 2.58 (SD = 0.900) for physical health problems, slightly higher than the female workers' mean score of 2.38 (SD = 1.275), with an overall mean of 2.49 (SD = 1.075). This suggests that both genders experienced considerable health issues, although the difference was relatively minor. In terms of coping strategies for physical hazards and health challenges, female workers had a significantly higher mean score of 2.57 (SD = 1.181) compared to male workers' mean score of 1.44 (SD = 0.680), indicating that female workers may employ more or different coping mechanisms, possibly due to differing physical resilience or social support structures. Regarding seasonal variations and job insecurity, male workers reported a mean score of 1.94 (SD = 0.964), whereas female workers had a significantly higher mean score of 3.13 (SD = 0.998), reflecting greater economic vulnerability or job instability among female workers. Furthermore, the dissemination of information about government policies and social welfare showed male workers with a mean score of 1.75 (SD = 1.305) compared to female workers' mean score of 1.00 (SD = 0.000). Both genders reported similar scores for common occupational hazards, with means of 2.43 (SD = 1.156 for males and SD = 1.123 for females), indicating equal exposure to occupational risks. The MANOVA results indicate significant gender differences across all dependent variables. The tests shows the following values: Pillai's Trace (0.574, $F_{(5, 174)} = 46.973$, $p < 0.001$, Partial Eta Squared = 0.574), Wilks' Lambda (0.426, $F_{(5, 174)} = 46.973$, $p < 0.001$, Partial Eta Squared = 0.574), Hotelling's Trace (1.350, $F_{(5, 174)} = 46.973$, $p < 0.001$, Partial Eta Squared = 0.574), and Roy's Largest Root (1.350, $F_{(5, 174)} = 46.973$, $p < 0.001$, Partial Eta Squared = 0.574). Given these significant p-values (all < 0.001), the null hypothesis was rejected and there was a 1 per cent of significant level. This analysis reveals that male workers predominated in this region's salt pan industry, resulting in a higher incidence of physical ailments, occupational health risks, and job insecurity among them compared to female workers. Meenakshi and Thomas (2021) opined that gender played a critical role in shaping the health and occupational experiences of salt pan workers, with women showed stronger coping mechanisms despite facing higher job insecurity. They emphasized the need for gender-sensitive policies to address these disparities and to improve overall worker welfare.

Analysis for Chi – square test

Testing of hypothesis

Hypothesis: 1

H_0: There was no association between the gender of the respondents and their perception of seasonal variations and job security of salt pan workers

H_1: There was an association between gender of the respondents and their perception of seasonal variations and job security of salt pan workers

Hypothesis: 2

H0: There was no association between gender and factors affecting job security in the salt pan industry.

H1: There was an association between gender and factors affecting job security in the salt pan industry.

$$\chi^2 = \left[\frac{(O_1 - e_1)^2}{e_1} + \frac{(O_2 - e_2)^2}{e_2} + \frac{(O_3 - e_3)^2}{e_3} + \ldots\ldots\ldots + \frac{(O_k - e_k)^2}{e_k}\right]$$

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i} \quad k = 1$$

Where, χ^2 = Chi squared, O_k = Observed values, E_k = expected values (McHugh, 2013)

Table 7 presents the associations between the gender of the respondents and their perceptions of two key aspects: seasonal variations in job quality and security, and factors affecting job satisfaction and security in the salt pan industry in the Tuticorin district. For the first variable, seasonal variations injob quality and security for salt pan workers, the results indicate a strong association with gender. The Phi value of 0.770 and the Contingency Coefficient value of 0.610 suggested a substantial relationship between the respondents' gender and their perceptions of seasonal variations. Furthermore, the Pearson Chi-Square value of 106.727, which was statistically significant ($p < 0.01$), confirmed that gender plays a critical role in shaping perceptions of seasonal impacts on job quality and security within this context. This finding highlights a pronounced difference in how male and female respondents experience or perceive the seasonal challenges associated with salt pan work. Devi and Narayanan (2018) noted that gender significantly influenced perceptions of job quality and security in the salt pan industry, with women often facing greater seasonal instability. They stressed the importance of incorporating gender perspectives in policy-making to ensure equitable labour conditions.

In contrast, for the second variable, factors' affecting job satisfaction and security in the salt pan industry, the association with gender was moderate. The Phi value of 0.459 and the Contingency Coefficient value of 0.417 indicated a reasonably strong but less pronounced relationship compared to the first variable. The Pearson Chi-Square value of 37.958 was also statistically significant ($p < 0.01$), demonstrating that gender differences influenced the perception of job satisfaction and security factors.The salt pan industry in Tuticorin has a gendered division of labour, with men handling physically demanding tasks and women performing less laborious roles.This results in differing perceptions of job quality and security, with men experienced greater job stability due to higher pay, while women experience heightened job insecurity due to temporary employment. The industry's seasonal nature further amplifies these disparities, necessitating a more targeted, gender-sensitive approach to address employment challenges and improve job quality and security. Women's perceived job satisfaction and security were influenced by their secondary earning status and economic dependence on salt pan work, and limited alternative employment opportunities. In rural areas like Tuticorin, women were more vulnerable to job-related challenges and were more likely to migrate during off-seasons, highlighting the significant role of gender in the salt pan industry.

Salt pan workers in Tuticorin district were exposed to a range of occupational health hazards, including dermatological issues such as skin allergies and ocular conditions like eye irritation, primarily due to prolonged exposure to salt particles and ultraviolet radiation. Even though, the salt industry contributed significantly to the regional economy, but the physical toll on workers remains substantial. Male workers, in particular, were frequently affected by chronic musculoskeletal disorders such as lower back pain, heat-induced hypertension, chemical exposure-related complications, and severe dehydration especially during peak summer months. Seasonal unemployment during the winter and the scarcity of alternative job opportunities further exacerbate their socio-economic vulnerabilities. To mitigate these risks, workers often resort to self-initiated coping mechanisms such as the use of personal protective equipment (PPE), basic self-care routines, and scheduled rest periods. However, these strategies are often insufficient without systemic intervention. The study highlights the urgent need for comprehensive modernization and mechanization of salt production processes. Emphasis is placed on implementing structured training programs, improving access to high-quality PPE, and ensuring consistent availability of essential amenities like clean drinking water, shade structures, and sanitation facilities at work sites. Nutritional security for workers and their families must be prioritized to enhance overall well-being.

Furthermore, the study proposed a range of actionable, cost-effective, and socially inclusive strategies to improve the socio-economic and occupational conditions of salt pan workers. These included the deployment of mobile health clinics, distribution of free PPE, regular health awareness campaigns, and the introduction of seasonal employment guarantee schemes. Additional recommendations encompass vocational training, improved access to low-interest credit facilities, subsidized food supply, affordable housing initiatives, and gender-sensitive wage policies to address disparities. Empowering women through entrepreneurship development and funding support for small-scale businesses is also critical. These interventions collectively foster sustainable livelihood enhancement and occupational safety for salt pan workers in the Tuticorin district.

Table 1. Socio demographics details of salt pan workers in Tuticorin district

Indicators	Cluster/Grouping	Frequencies	Per cent
Gender	Male	104	57.8
	Female	76	42.2
Age	25-34 Yrs	15	08.3
	35-44 Yrs	121	67.2
	45-54 Yrs	7	03.9
	55-64 Yrs	26	14.4
	65 Years and over	11	06.1
Marital status	Married	123	68.3
	Widowed	57	31.7
Family members	2-5	169	93.9
	5-7	11	06.1
Residential area	Rural	156	86.7
	Urban	24	13.3
Weekly income	More than Rs 2000	30	16.7
	Rs.2001-Rs.4000	17	09.4
	Rs.6001-Rs. 8000	88	48.9
	Rs.8001-Rs.10000	45	25.0
Income from other sources	Alternate business	27	15.0
	Family support	46	25.6
	No additional Income	107	59.4
Weekly expenditure	Rs.2001-Rs 4000	150	83.0
	Rs.4001-Rs.6000	19	10.6
	Rs.6001-Rs.8000	11	06.1
Savings	Less than Rs. 5,000	11	06.1
	Rs.5,000 - Rs.10,000	50	27.8
	Rs.10,000 - Rs.20,000	23	12.8
	No savings	96	53.3
Debt	No debt	87	48.3
	Less than Rs. 10,000	60	33.3
	Rs.10,000 - Rs.20,000	33	18.3
Sources of debt	Friends	15	08.3
	Money Lenders	77	42.8
	Private Bank	31	17.2
	No debt	57	31.7

Source: Primary data, N=180

Table 2. Occupational hazards and physical problems of salt pan workers

Indicators	Cluster/Grouping	Frequencies	Per cent
	Heat stress and dehydration	53	29.3
Occupational hazards in their daily work	Skin conditions and eye irritation	67	37.0
	Musculoskeletal injuries	32	17.7
	Respiratory issues	22	12.2
	Equipment related issues	6	03.8
	Hypertension and heart diseases linked to heat stress	45	25.0
Physical problems and Hazards in the salt pan region	Dermatitis and skin cancer due to chemical exposure	37	20.6
	Back pain and joint injuries from heavy lifting	62	34.4
	Dehydration and electrolyte imbalances	36	20.0
	Job insecurity due to market uncertainty	115	63.9
Factors affecting job quality and security of salt pan workers	Physical strain and health concerns	58	32.2
	Limited opportunities for skill development and advancement	103	51.5
	Yes significant fluctuations based on salt production	72	40.0
Seasonal variations in job quality and security of salt pan workers	Yes, but relatively minor changes due to local climate	33	18.3
	Seasonal trends due to external factors	43	23.9
	Fluctuations too irregular for seasonal patterns	32	17.8

Source: Primary data, N=180

Table 3. Strategies to overcome challenges faced by salt pan workers

Indicators	Cluster/Grouping	Frequencies	Per cent
	Income sources during off-seasons	36	20.0
Navigate the seasonal variations and job insecurity	Participating in skill development programs	86	47.8
	Government provided safety nets and subsidies	58	32.2
Salt pan workers access and disseminate information about government policies and social welfare programs	Through labour unions and worker's associations	22	12.2
	Digital platforms and mobile apps to access information	26	14.4
	Personal protective equipment	88	48.9
Strategies and challenges face salt pan workers in their daily work	Traditional self-care practices	43	23.9
	Seeking health care services proactively	25	13.9
	Rest and Recovery	24	13.3

Table 4. ANOVA test for mean difference among socio demographic variables

Variables	Mean Square	F-Value	P – Value
Age	24.071	25.505**	0.001
Marital status	98.800	308.533**	0.001
Family members	00.491	8.889**	0.003
Income from other sources	27.298	28.235**	0.001
Savings	135.960	25.388**	0.001
Debt	70.908	383.726**	0.001
Sources of debt	75.848	34.422**	0.001
Residential Area	04.379	47.467**	0.001

Source: Authors estimation; ** indicates 1% level of significance; N = 180

Table 5. Relationships between weekly expenditure and weekly income

R- Square Value	â coefficient value	t-value	Co-efficient Std.Err	Sig.Value
0.548	0.132**	10.897	0.114	0.001

Source: Authors estimation; ** indicates 1% level of significance; N = 180

Table 6. Multivariate analysis of variance test of between dependent variables

Dependent variables	Mean square	F	Sig	Partial Eta Squared
Physical health problems	1.676	1.453**	0.000	0.008
health challenges and Physical hazards	55.425	64.767**	0.000	0.267
Seasonal variations and job insecurity	62.106	64.900**	0.000	0.267
Disseminate information about government policies and social welfare programs	24.700	25.052**	0.000	0.123

Note: p value = 0.000<0.05 (** indicates 1% level of significance), N=180

Table 7. Associations between gender and perceptions of job quality, security, and seasonal variations among salt pan workers

Variables	Gender of the respondents	Phi Value	Contingency coefficient Value	Pearson Chi-Square Value
Seasonal variations in job quality and security for salt pan workers	Male Female	0.770	0.610	106.727**
Factors affecting job satisfaction and security in the salt pan industry	Male Female	0.459	0.417	37.958**

Note: p value = 0.000<0.05 (** indicates 1% level of significant), N=180

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