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Full Length Research Paper

An Insight to the Bell metal Industry of Bankura, West Bengal, India

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Abstract
Metal handicrafts bear a long tradition of excellence and unique craftsmanship. Bankura has a rich cultural heritage of handloom industry and handicrafts. It bears international repute for terracotta temples, hand-woven textiles, conch shell carving and exquisite craft of bell and brass metal engraving. Though this handicraft product possesses a ready market both at home and in the neighboring states, there are some grey areas demanding immediate attention. This paper attempts to assess the nutritional status, socio-economic background and occupational health hazards of bell and brass metal workers of Bankura. Workers numbering 48 in the age group of 20-76 years who were willing to co-operate for the study were selected by convenient sampling method. The evaluation of nutritional status revealed presence of malnutrition (18.75 %) among them. The mean height, weight, Body mass Index and Waist/Heap Ratio of the population were 1.63 ± 0.09 m, 56.31 ± 7.82 Kg, 21.26 ± 3.15 & 0.95 ± 0.07 respectively. The age-wise distribution of the workers revealed that majority (46.67 %) of the males and females (66.67 %) belonged to the age group of 36-45 years. The gender-wise distribution of the artisans revealed that mass of the population (93.75 %) was represented by males. Joint family (66.67 %) type still prevails in the community. 62.5 % of the workers lived in medium-size family system. The literacy rate (91.67 %) among bell metal artisans was encouraging. The average monthly household income (Rs. 6062) reveals that the workers are thriving in poverty. Hypertension, musculoskeletal pain, vision disorder and respiratory trouble have been found to be more prevalent.

Key words: *Handicrafts, Bell metal, Body mass Index (BMI), Socio economic background, Occupational health hazards.*

Introduction

The metal handicrafts owe a very ancient lineage in India. The origin of metal handicrafts in India can be traced way back to Indus Valley Civilization. The discovery of the small bronze statue at the ancient site of Mohenjo-Daro testifies the antiquity of Indian metal crafts 5000 years ago. The craft witnessed its many rise and fall during different ruling dynasties. It received its highest perfection during the Gupta Period which is considered as the golden age of Indian art. In the Deccan plateau, the art achieved its greatest development in the 9th century under the royal patronage of Vijayanagar kingdom (Government of India, 2006). Bell and brass metal craft flourished in Bankura during the ancient medieval period under the reign of Malla dynasty. The craftsmen of olden days were not only proficient in working with precious metals, but they also used their skill and creativity even in the production of articles of daily use with brass, copper and other metals. The royal assistance brought extensive popularity of the products and in course of time the craft began to grow in range and variety.

Bell metal, a form of bronze, is a hard alloy of copper and tin which are mixed together at a proportion of 78: 22. It is used for making bells and related instruments, such as cymbals. Brass metals are an alloy of copper and zinc (70:30) and are known for its bright gold-like appearance. This bell and brass metal crafting is labour intensive, tradition oriented, having a legacy of unique craftsmanship with a decentralized set-up. It is estimated that around 2.5 % of the total population of Bankura district are involved in this sector (Government of West Bengal, 2016). The craft is mainly practiced by the people of the Kansari caste. The sector is presently encompass with several problems, such as rising prices of the raw materials, inadequate working capital, lack of training facilities, weak marketing strategy, low wages of the hard working artisans and above all, competitive global market (Konark Institute of Science & Technology, 2015).

Nutritional deficiency is another common factor in this community. The rigorous workload further worsens the situation. The underdeveloped socio-economic condition and lack of public health concern make their situation more pathetic. Occupational health hazards also possess a threat to Bell metal industry as most of the artisans were found to be sufferings with various health ailments (Roy, 2014).

There is no such work on the socio economic and nutritional status of the bell metal workers of Bankura and hence the study was undertaken to assess the nutritional status and socioeconomic condition of the workers and to evaluate the health status of the workers.

Materials and Methods

Study Area

Bankura, a place of crafts and culture, has a rich historical past with plentiful natural inheritance. Bishnupur, Ajodhya and Kenjakura were selected as the study area (Figure 1) based on the maximum availability of bell and brass metal workers. Bishnupur, the capital of Malla dynasty and a tentative site of UNESCO world heritage is situated at 23°05′N Latitude and 87°19′E Longitude with a population of 67,783. Ajodhya is a large village of Bishnupur block with a population of 2862 of which 1445 are males and 1417 are females. Kenjakura, with a population of 3955, is a Village in Bankura-I Block in Bankura District (Census, 2011).

Bell metal workers numbering 48 in the age group of 20-76 years who were willing to co-operate for the study were chosen from those places by convenient sampling method.

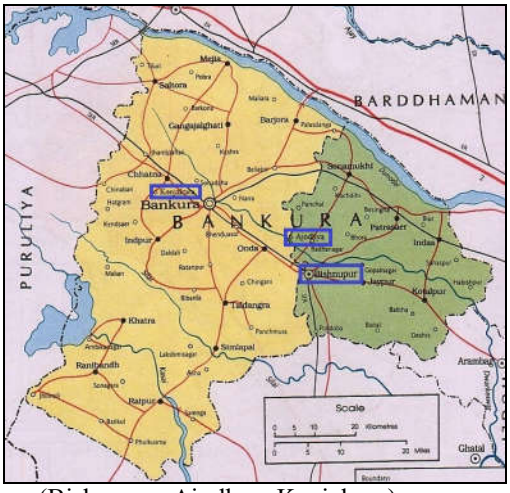

Fig. 1 Map showing the location of Study area (Bishnupur, Ajodhya, Kenjakura)

Data collection

The present study is mostly based on primary data source that was collected through a field survey in those study areas during Sep-Oct, 2015. Bell & brass metal workers numbering 48 were selected as respondents by convenient sampling method. Secondary data was taken from different research journals, books and publications of various government agencies. The statistical analysis of data was performed by using Microsoft Office Excel software.

Assessment of nutritional status

Anthropometry is the science which deals with the measurement of size, weight, and proportions of the human body (Ganguly and Ganguly, 2015). The word 'anthropometry' was derived from the Greek word 'anthropo' meaning 'human' and the 'metron' meaning 'measure' (Ulajaszek, 1994). The field of anthropometry encompasses measurement of the human body in terms of dimensions of bone, muscle and adipose tissue (CDC, 2009). Weight, stature (standing height), skinfold thicknesses, circumferences (head, Chest, Mid upper, waist, heap, etc.) of the respondents were measured.

Height is often affected by insufficient dietary uptake, irregular eating habits and certain diseases (Usharani and Lakshmi, 2014). Height was measured using a vertical measuring rod with headpiece without wearing footwear. The respondents were made to stand on flat surface, heels together and head positioned so that the line of vision was at right angles to the body. The arms hang freely by the side where as buttocks and heels are in contact with vertical measuring rods. The individuals were asked to take breaths in deeply and maintain a fully erect position. The movable headpieces brought onto the topmost point on the head with sufficient pressure to compress the hair. An average of three successive measurements was taken, final measurement are recorded to the nearest of 0.1 cm.
Body weight is the most widely used method to assess the anthropometric measurements for the evaluation of nutritional status (NIN, 2009). Digital weighing machine was used to measure the body weight of the respondents. Zero error of the scale was checked, the scale was then calibrated and measurements were done under basal conditions. The respondents were made to stand on the platform of the balance without shoes, with normal clothing and without touching anything else. The measurement was observed to the nearest of 0.50 kg.

Body Mass Index (BMI)

Body Mass Index (BMI) or Quetelet`s Index is a precise reflection of body fat percentage (Umaito, 2006; Keys et. al, 1972). It provides a simple numeric measure of a person's thickness or thinness that is commonly used to classify underweight, overweight and

obesity among adults (WHO, 2015). WHO Expert Committee recommended the use of BMI for the determination of the nutritional status of the population. The formula Weight (kg) / Height (m^2) was used to calculate BMI. Those values of the selected respondent were calculated and precisely categorized.

Waist/ Heap Ratio (W/H Ratio)
The W/H Ratio has been used as an indicator of health conditions. Research shows that people with apple-shaped bodies face more health risks than those with pear-shaped bodies. W/H Ratio is used as a measurement of obesity, which is a probable indicator of health status. The abdominal obesity is defined as a waist–hip ratio above 0.90 for males and above 0.85 for females (WHO, 2000).

Socio-economic survey
Selection of sample & preparation of questionnaire are the fundamental part of a research. A schedule containing standardized questionnaire was developed by the researchers that has direct consequence to the society. The selected respondents were interviewed to collect information on the socioeconomic background of the bell metal workers relating to age, sex, education, number of family members, income of the family etc.

Evaluation of the occupational health hazards
Researchers consulted with bell & brass metal workers to know whether they suffer any health problems, including respiratory trouble, musculoskeletal pain, common cold or vision disorder. Resting blood pressure of the workers was also measured and precisely categorized (Chobanian et al., 2003).

Result and discussion
Anthropometric Measurements
The respondents were classified as underweight, normal, overweight and obese as per BMI. In the present study (Table 1 & Figure 2), Out of the total 48 respondents, 18.75 % of the workers were in the underweight (BMI ≤18.5) category. Among them, 33.33 % were severely thin, 11.11 % were moderately thin and 55.56 % were with mild thinness. 66.67 % of the bell & brass metal workers were with normal nutritional status. 14.58 % artisans were overweight and none of them was found to be obese. The mean height, weight, BMI and W/H Ratio of the population were 1.63 ± 0.09 m, 56.31 ± 7.82 Kg, 21.26 ± 3.15 & 0.95 ± 0.07 respectively (Table 2). The occurrence of malnutrition may be due to the inadequate diet, unhygienic working condition, rigorous workload and lack of public health concern.

Age
As a preface to an analytical study of the bell metal workers of Bankura, a survey on the age distribution of the sample was carried out. It is useful to determine the proportion of work force among workers. The present study (Figure 3) showed the absence of under-age workers (< 18 years) among total workforce. The age-wise distribution of the workers revealed that majority (46.67 %) of the males and females (66.67 %) belonged to the age group of 36-45 years. Among the 48 respondents surveyed, a majority (47.92 %) of the population corresponded to the age-group of 36-45 years as the efficiency is relatively higher at this age due to their agility & experience.

Gender
The bell and brass metal engraving is one of the activities which provide the scope of women participation. However, the gender-wise distribution (Figure 4) of the artisans revealed that a majority (93.75 %) of the population was represented by males. This incongruity may be due to the intricate crafting technique, strenuous workload and intense demand of production. Moreover, women had to accomplish household responsibilities except the professional demand of their job.

Family Type & Size
Nature of the family is one of the demographic indicators of a population. Family type and size contributes significantly to the gross family income. The results (Table 3) of the present study indicated that joint family (66.67 %) still prevails in this community. 62.5 % of the workers lived in medium-size and 27.08 % of the population lived in a large family system. Nuclear families tend to had small family size (10.42 %). This finding was in discordance with the statement of the year book of India (2000) where 82 % of the families were reported to be of nuclear type. The bell metal crafting is one of such profession which involves all family members who contribute their precious time in crushing, molting, hammering and designing.

Educational Status of the bell metal workers
Education provides the strength, economic prosperity and social environment in a community (Ganguly et al., 2016). The present investigation (Figure 5) revealed that 8.33 % of bell metal workers have never attended school, 16.67 % have completed primary education and 39.58 % attended middle school. It also illustrated that 29.17 % of the artisans have completed secondary education and lesser percentage (6.25 %) of population studied up to higher secondary. The literacy rate among bell metal workers was 91.67 % which is much higher in comparison to the national average (74.04 %) (Census, 2011). However, 60.42 % of the percents of the artisans were found illiterate.

Socio-economic Status

Socio-economic condition plays a significant role in determining the standard of living of people. The bell metal crafting involves high production cost. The household economic profile (Figure 6) of the bell and brass metal workers revealed that most of them (45.83 %) belonged to the monthly income category of Rs. 3001-6000. Master artisans, constituting 12.5 % of the community were earning more than 9000 per month. Women also were involved in the carving activity. The data shows that the average monthly household income (Rs. 6062) and standard of living of the workers were miserable.

Occupational Health Hazards

An occupational disease is any chronic ailment contracted primarily as a result of an exposure to risk factors arising from work activity (WHO). It was estimated that each day an average of 137 persons die from occupational diseases and an additional 17 die from injuries throughout the world (CDC, 1996). Occupational health hazards are becoming a serious concern of this sector. Generally, crafting communities have poorly ventilated and inadequately lighted rooms. Workers have to work under unhygienic conditions leading to health problems. The major health ailment (Figure 7) of bell metal workers was musculoskeletal pain (55.26 %) including back pain, knee pain and joint pain. 15.80 % of workers suffer from respiratory trouble due to dust of metal. Another serious complication of the workers was the prevalence of asthma (2.63 %) and parorychia (5.26 %). Among the clinical symptoms dimness of vision was reported in 18.42 % of cases. 29.16 % of the workers were suffering with hypertension and 41.67 % with prehypertension (Table 4). The majorities of the problems were due to poor ergonomics, improper work station design, nature of work, metal dust and inadequate rest of the workers.

Table 1: The International Classification of underweight, overweight and obesity according to BMI

Sl. No.	Classification	BMI (Kg/m^2) Principal cut-off points	Number of Respondents	Percentage
1.	**Underweight**	**<18.50**	**09**	**18.75**
	Severe thinness	<16.00	03	33.33
	Moderate thinness	16.00 - 16.99	01	11.11
	Mild thinness	17.00 - 18.49	05	55.56
2.	**Normal range**	**18.50 - 24.99**	**32**	**66.67**
3.	**Overweight**	**≥25.00**		
	Pre-obese	25.00 - 29.99	**07**	**14.58**
4.	**Obese**	**≥30.00**	--	--
	Obese class I	30.00 - 34.99		
	Obese class II	35.00 - 39.99		
	Obese class III	≥40.00		
	Total		**48**	**100**

Source: Adapted from WHO, 1995, WHO, 2000 and WHO 2004.

Table 2: The Statistical Assessment of Anthropometric Measurements

Parameter	Height (m)	Weight (Kg)	BMI	W/H Ratio
Mean	1.63	56.3125	21.263125	0.9525
Standard Error	0.01302616	1.1283564	0.454588423	0.010612869
Median	1.635	55.5	21.09	0.945
Mode	1.57	52	21.09	0.95
Standard Deviation	0.090247886	7.817482454	3.149480981	0.07352811
Sample Variance	0.008144681	61.11303191	9.919230452	0.005406383
Kurtosis	-0.200670744	-0.677436337	0.053618675	0.99400301
Skewness	0.108374442	0.135637738	0.245567358	0.926639883
Range	0.41	32	14.71	0.36
Minimum	1.42	42	14.93	0.83
Maximum	1.83	74	29.64	1.19
Sum	78.24	2703	1020.63	45.72
Count	48	48	48	48
Confidence Level (95.0%)	0.026205254	2.269960245	0.914513933	0.021350337

Source: Microsoft Office Excel Worksheet

Table 3: Family Status of Respondents

Sl. No.	Family Type	Number of Respondents	Percentage
1.	Nuclear	16	33.33
2.	Joint	32	66.67
	Family Size		
1.	Small (Up to 3)	05	10.42
2.	Medium (4-6)	30	62.50
3.	Large (More than 6)	13	27.08

Source: Primary data

Table 4: Classification of Blood Pressure of Respondents

Classification of Blood Pressure				
Category	**Systolic (mm Hg)**	**Diastolic (mm Hg)**	**Number of Respondents**	**Percentage**
Hypotension	≤ 90	≤ 60	--	--
Normal	90–119	60–79	14	29.17
Prehypertension	120–139	80–89	20	41.67
Stage 1 Hypertension	140–159	90–99	8	16.67
Stage 2 Hypertension	160–179	100–109	4	8.33
Stage 3 Hypertension	≥180	≥110	2	4.16

Source: Primary data

Fig 2: Assessing anthropometric measurements of Bell metal workers

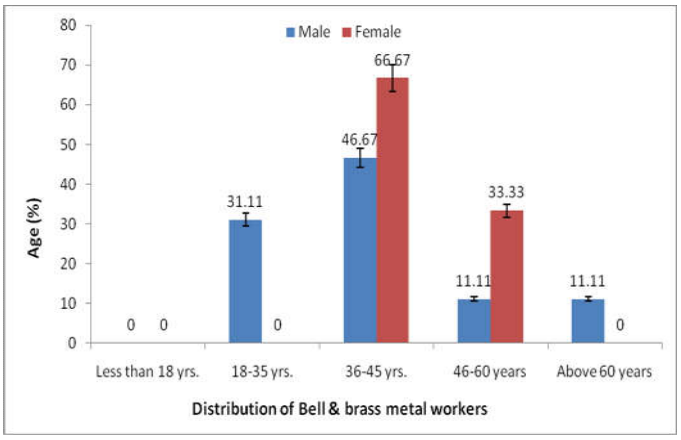

Fig 3: The Age-wise (%) distribution of Bell and brass metal workers

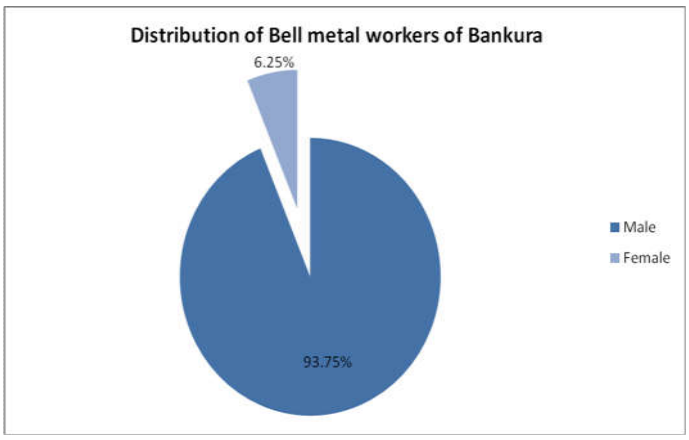

Fig 4: The Gender-wise (%) distribution of Bell and brass metal workers

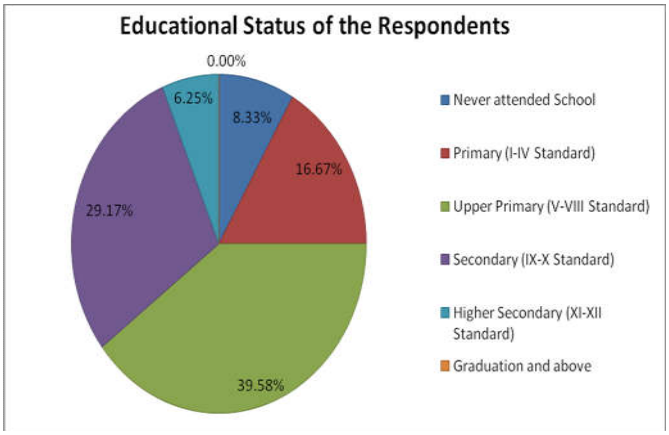

Fig 5: Educational Status of Bell and brass metal workers of Bankura

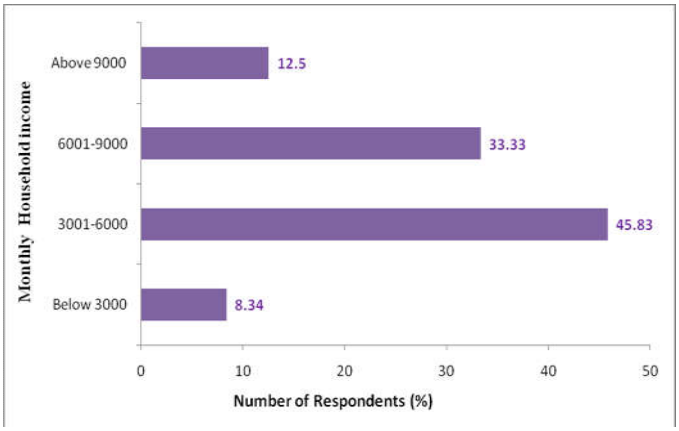

Fig 6: Economic Status of the Bell and brass metal workers of Bankura

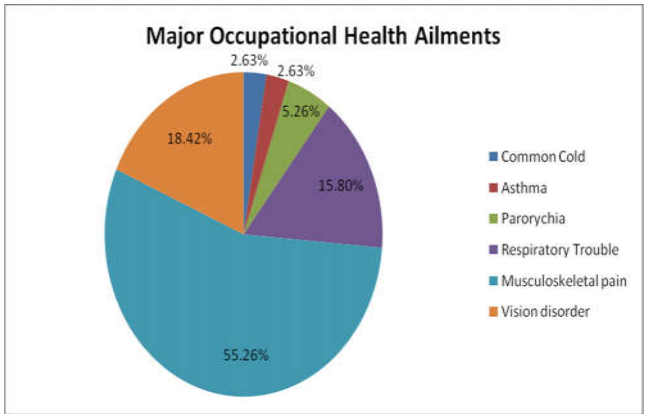

Fig 7: Major Health Ailments of the Bell and brass metal workers of Bankura

(Source: Primary data)

Conclusion

The age-old traditional bell and brass metal crafting has been kept alive by those professionally skilled household workers. The study presents an account of this community with a view to identify the factors leading to its decline. It also attempts to focus on aspects of the socio economic conditions of the artisans. In addition, the nutritional status and occupational health issues of the community had also been dealt with. The finding of this study has considerable relevance to evaluate the socioeconomic conditions and standard of living of the bell metal workers. The educational status and literacy rate among the artisans was quiet encouraging. The industry was prosperous when raw materials were available abundantly and the competitions from other industries were less pronounced. But, lack of innovation and professionalism paves way to a variety of problems ranging from raw material to marketing of products in the competitive global scenario. Provision of raw materials at reasonable price, financial assistance, skill development programs, outsourcing, regular health check-up, proper diet and increase of public health concern are the need of the demand of the society.

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Ethics
All the authors read and approved the manuscript and no ethical issues involved.

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