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Research Article

Differences in Selected Health Traits between Occupational Groups among Oraons of Jalpaiguri District, West Bengal

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Occupational health deals with diseases or injuries caused due to work. Different types of work cause different types of ill-effect on health and may cause changes in health traits; empirical studies on the issues are scanty. The present study aims to investigate the differences in selected health traits between two occupational groups of the same ethnic origin. Cross-sectional data collected on 357 adult Oraon labourers engaged in two different occupations, namely, agriculture and brickfield in Jalpaiguri district, West Bengal, of which are 62 male and 43 female agricultural labourers and 136 male and 116 female brickfield labourers. Data consists of anthropometric measurements, blood pressure, and haemoglobin traits. Health status assessed in terms of BMI, systolic and diastolic blood pressure, and haemoglobin level following standard cut-off values. Mean values of both the occupational groups show similar trends in case of selected anthropometric and health traits. Individuals are ecto-mesomorphic irrespective of sex and occupation. Majority of individuals of either sex of both the occupational groups are underweight but hypertensive. In anthropological data, the trend of mean values is important than mere statistical significance. Data indicates that both the occupational groups have similar health condition, maybe due to their heavy manual activity.

1. Introduction

Occupation that generates income [1] plays a vital role in the well-being of individuals [2] engaged in jobs. But many working conditions create physical and mental stress that causes ill effects on health and enhance the chances of several infectious [3], communicable [4], and noncommunicable diseases [5, 6]. In view of the problems in different occupations and working environments, World Health Organization had taken a Global Strategy on Occupational Health for All by the Year 2000 [7]. India has also included occupational and environmental health as area of concern in the tenth five-year plan (2002–2007) [8].

In recent times, emphasis is given primarily on sedentary occupations which may enhance the chances of cardiovascular diseases [9], diabetes [10], and cancer [11]. Night shifting work can disturb biological clock and may have some ill effects on health [12] and increases the chances of cardiovascular diseases [13] and diabetes [14]. Heavy manual labour too can cause low back pain [15, 16], injuries [17], musculoskeletal problems [18], and so forth, to the workers. Workers at mining and quarry industries suffer from lung problems [19, 20] and hearing loss [21] due to their working environment. Agriculture is the main occupation in rural India. The people who work at agricultural field and plantation area may suffer from worm infestation [22] and snake bite [23] as they have to work in bare foot. Pesticide poisoning is another risk for agricultural worker [24]. Sugar cane farmers suffer from several lung diseases [6]. Not only physical health, but also the mental health is affected due to job stress [25]. Fear of losing job and unemployment may also prevent one from taking health care timely [26].

Apart from diseases and injuries, sedentary occupations may increase chances of obesity [27] due to low level of physical activity; on the other hand, high physical activity demanding occupations may lead to underweight [28].

Working overtime may leads to increase in BMI and waist circumferences in white-collar male workers [29]. Manual workers develop better hand grip strength than sedentary individuals [30] but suffer from anaemia [22]. Work in brick field demands heavy manual labour (for carrying heavy loads for a long hour), which may enable labourers to achieve greater physical strength, due to extensive use of their muscles [31] or vice versa. It is reported that among the brick field worker aerobic capacity varies across different types of work [32].

In view of the above, it can intuitively be understandable that different types of work may cause different types of ill health effect. The changes can be reflected from the health traits of the individuals engaged in different occupations. However, studies on this issue are limited in the Indian context [30]. Thus, the present study aims to investigate the differences in selected health traits between two occupational groups of the same ethnic origin.

2. Material and Methods

2.1. Population and Area. Present cross-sectional data was collected from Oraon labourers engaged in two different occupations, namely, agriculture and brickfield, living adjacent to Birpara Police Station of the Jalpaiguri district of West Bengal. The present study was part of a larger biocultural research project. The study was restricted to single ethnic (endogamous) group, Oraon, in order to eliminate possible ethnic/genetic effect in different health-related traits. The Oraon is a Dravidian speaking tribal population who inhabited mainly Chotanagpur regions and Santhal Parganas of Bihar [33]. They have been supposed to have migrated about 100 years ago to Jalpaiguri area from their original homeland mainly as tea garden labourers [33] and at present they work as labourers at agricultural field and brickfield also.

2.2. Data Collection and Data Types. Data were collected from the individuals of both sexes, who volunteered to participate in the study. No statistical sampling of the individuals had been done because of some obvious difficulties in the field like suspicion. Complete enumeration was done for sociodemographic data from all the Oraon households of Rangalibajna village of Madarihat Police Station for agricultural labourers and Etelbari village of Birpara Police Station for brickfield labourers following well-tested questionnaire/schedule. After that, data on anthropometric and blood parameters were taken from the adult individuals of both sexes who volunteer to participate in the study. A total of 357 adult individuals had been measured including 62 male and 43 female agricultural labourers and 136 male and 116 female brickfield labourers. Both groups live in very close proximity; therefore, the possible effect of physical environment on health related traits can be ruled out.

Anthropometric data were taken by a single investigator (Subrata K. Roy) following IBP (International Biological Programme) basic list of measurements, using standard techniques and instruments [34], including: stature (cm), weight (kg), mid-upper arm circumference (cm), calf circumference (cm), chest circumferences in inhalation and exhalation (cm), anteroposterior and transverse chest diameters (cm), Biepicondylar breadth of humerous (cm), Bicondylar breadth of femur (cm), biceps skinfold thickness, (mm), triceps skinfold thickness (mm), subscapular skinfold thickness, (mm), suprailiac skinfold thickness (mm), and calf skinfold thickness (mm).

Blood pressure data was measured using mercury sphygmomanometer and stethoscope following AHA standards; data includes systolic (SBP) and diastolic (DBP) blood pressure. Pulse rate was also measured for 30 seconds feeling the radial artery on left hand. Haemoglobin level was measured using oxyhaemoglobin method following standard techniques [35]. Body mass index (BMI) has been calculated from the anthropometric measurements using the formula: BMI = body weight (kg)/stature (m^2).

2.3. Somatotype Rating. The anthropometric somatotype techniques have been used following Carter and Heath [36].

Endomorphy was determined by using the following formula: $0.0000014\,(X^3) - 0.00068\,(X^2) + 0.1451\,(X) - 0.7182$, where X is the sum of triceps, subscapular, and suprailiac skinfold thickness adjusted for stature; that is, X = sum of the skinfold thickness × (170.18/stature).

Mesomorphy has been determined by using the following formula: [(0.858 × biepicondylar diameter of humerous) + (0.601 × bicondylar diameter of femur) + {0.188 × (mid-upper arm circumference − triceps skinfold)} + {0.161 × (calf circumference − calf skinfold)}] − (stature× 0.131) + 4.50. As a note of caution both triceps and calf skinfold thickness have been measured in millimeter scale and at the time of subtraction this unit has been converted into centimetre scale in order to equalize the unit of measurement.

Ectomorphy has been obtained by using the formula HWR (height weight ratio) × 0.732 − 28.58, where HWR = Stature/Weight$^{1/3}$. If HWR is less than 40.75 but greater than 38.25, ectomorphy has been determined by using HWR × 0.463 − 17.63. If HWR is equal to or less than 38.25, a rating of 0.1 has been assigned to the ectomorphy rating.

The X and Y coordinate have been calculated using the following formulae:

$$X = \text{ectomorphy} - \text{endomorphy},$$

$$Y = 2 \times \text{mesomorphy} - (\text{ectomorphy} + \text{endomorphy}).$$

2.4. Classification of Data. BMI values were classified as severe thinness (<16.00 kg/m^2), moderate thinness (16.00–16.99 kg/m^2), mild thinness (17.00–18.49 kg/m^2), normal (18.50–24.99 kg/m^2), overweight (25.00–29.99 kg/m^2) and Obese (≥30.00 kg/m^2) following standard cut-off values [37]. Haemoglobin level was classified as normal (male > 13 g/dL, female > 12 g/dL), mild anaemic (male 11.0–12.9 g/dL, female 11.0–11.9 g/dL), moderate anaemic (8.0–10.9 g/dL), and severe anaemic (<8.0 g/dL) according to WHO classification [38]. Blood pressure data were classified as normal (SBP < 120 and DBP > 80 mm Hg), prehypertensive (SBP 120–139 or DBP 80–89 mm Hg), stage 1 hypertensive (SBP 140–159 or DBP 90–99 mm Hg), and stage II hypertensive (SBP ≥ 160 or

Table 1: Descriptive statistics of selected anthropometric traits of agricultural and brickfield labourers of either sex.

Selected anthropometric traits	Male					Female				
	Agricultural labourer ($n = 62$)		Brickfield labourer ($n = 136$)		t-test (df = 196)	Agricultural labourer ($n = 43$)		Brickfield labourer ($n = 116$)		t-test (df = 157)
	Mean	S.D	Mean	S.D		Mean	S.D	Mean	S.D	
Age (years)	31.00	10.88	34.79	11.64	2.17*	29.14	7.84	30.62	10.16	0.87
Stature (cm)	163.56	6.33	161.57	6.52	2.01*	151.53	5.81	149.50	5.81	1.95
Weight (kg)	48.71	4.77	47.94	5.98	0.89	41.24	4.44	40.83	4.65	0.51
BMI (kg/m^2)	18.21	1.45	18.34	1.77	0.52	17.93	1.35	18.27	1.89	1.08
Circumferences (cm)										
Midupper arm	22.45	1.33	22.17	1.79	1.10	20.69	1.30	20.83	1.92	0.42
Calf	29.02	1.72	28.11	3.01	2.21*	27.15	1.58	26.79	2.72	0.79
Chest (exhalation)	79.66	3.57	77.76	4.09	3.14*	71.64	6.27	72.72	4.18	1.26
Chest (Inhalation)	82.02	3.65	79.99	4.05	3.36**	74.25	3.93	74.21	3.78	0.06
Chest diameters (cm)										
Anteroposterior	23.93	1.43	24.85	4.68	1.52	22.05	1.18	22.85	1.67	2.86*
Transverse	17.49	1.41	17.24	1.29	1.19	15.96	1.33	15.64	1.12	1.54
Skinfold thicknesses (mm)										
Biceps	3.19	0.56	2.81	0.88	3.22**	4.05	1.13	4.02	1.87	0.13
Triceps	5.15	1.23	4.62	1.63	2.26*	8.34	1.23	8.30	1.63	0.07
Calf	4.74	1.18	4.69	1.90	0.19	7.4	2.08	7.61	3.04	0.41
Subscapular	8.69	1.44	7.81	3.05	2.14*	9.53	2.51	9.52	3.26	0.01
Suprailiac	5.69	1.43	5.2	2.51	1.44	6.99	3.02	6.59	3.73	0.64

*$P < 0.05$, **$P < 0.01$.

Table 2: Descriptive statistics of somatotype components in agricultural and brickfield labourers of either sex.

Somatotype components	Male					Female				
	Agriculture labourer ($n = 62$)		Brickfield labourer ($n = 136$)		t-test (df = 196)	Agriculture labourer ($n = 43$)		Brickfield labourer ($n = 116$)		t-test (df = 157)
	Mean	S.D.	Mean	S.D.		Mean	S.D.	Mean	S.D.	
Endomorphy	1.81	0.44	1.77	0.68	0.36	2.45	0.76	2.77	1.09	1.71
Mesomorphy	2.72	0.84	2.70	0.90	0.46	2.22	0.74	2.46	0.96	1.00
Ectomorphy	4.24	1.02	4.12	1.05	0.75	3.59	0.88	3.36	1.15	1.21
X	2.44	1.15	2.35	1.45	0.40	1.14	1.49	0.59	1.97	1.65
Y	−0.57	2.61	−0.54	2.49	0.07	−1.53	1.89	−1.28	2.46	0.59

Table 3: Descriptive statistics of selected health traits in brickfield and agricultural labourers of either sex.

Selected health traits	Male					Female				
	Agricultural labourer ($n = 62$)		Brickfield labourer ($n = 136$)		t-test (df = 196)	Agricultural labourer ($n = 43$)		Brickfield labourer ($n = 116$)		t-test (df = 157)
	Mean	S.D	Mean	S.D		Mean	S.D	Mean	S.D	
Systolic blood pressure (mm./Hg)	127.15	16.67	126.05	22.22	0.35	124.51	16.93	120.09	25.75	1.04
Diastolic blood pressure (mm./Hg)	84.35	10.05	82.34	13.29	1.06	84.28	13.76	81.39	15.45	1.08
Pulse rate (bits/min)	73.61	9.42	75.48	9.19	1.31	76.33	9.74	78.62	11.89	1.14
Hemoglobin level (g/dL)	11.87	1.58	10.84	2.62	2.86*	9.29	1.62	8.61	2.15	1.88

*$P < 0.05$.

Table 4: Classification of age and selected health traits in brickfield and agricultural labourers of male and female, respectively.

	Male				Female			
	Agricultural labourer (n = 62)		Brickfield labourer (n = 136)		Agricultural labourer (n = 43)		Brickfield labourer (n = 116)	
	n	%	n	%	n	%	n	%
Age groups (years)								
Up to 20	8	12.90	14	10.29	4	9.30	20	17.24
21–30	30	48.39	50	36.76	24	55.81	45	38.79
31–40	13	20.97	30	22.06	10	23.26	31	26.72
41–50	8	12.90	27	19.85	5	11.63	17	14.66
More than 50	3	4.84	15	11.03	—	—	3	2.59
BMI category (WHO, 2004)								
Severe thinness	3	4.83	8	5.88	2	4.65	10	8.62
Moderate thinness	10	16.12	17	12.50	8	18.60	18	15.51
Mild thinness	26	41.93	50	36.76	20	46.51	38	32.75
Normal	23	37.09	58	42.64	13	30.23	50	43.10
Overweight	—	—	2	1.47	—	—	—	—
Anaemic status (WHO, 2011)								
Severe	1	1.61	9	6.72	10	23.26	36	31.03
Moderate	6	9.68	47	35.07	26	60.47	66	56.90
Mild	40	64.52	53	39.55	7	16.28	11	9.48
Normal	15	24.19	25	18.66	—	—	3	2.59
Blood pressure category (JNC 7)								
Normal	12	19.35	47	35.07	13	30.23	51	43.97
Prehypertensive	31	50.00	46	34.33	16	37.21	37	31.90
Stage 1 hypertension	11	17.74	23	17.16	9	20.93	9	7.76
Stage 2 hypertension	8	12.90	18	13.43	5	11.63	19	16.38

DBP $\geq$ 100 mm Hg) according to JNC-7 blood pressure classification [39].

2.5. Analysis of Data. Descriptive statistics and t-statistic have been used to find out the differences in selected health traits, that is, anthropometric, blood pressure, pulse rate and haemoglobin traits between the two occupational groups. The collected data were analysed using SPSS version 16.0 (SPSS Inc., Chicago, IL, USA).

3. Results

Table 1 shows the descriptive statistics of selected anthropometric traits of the two occupational groups, separately for sexes. Male agricultural labourers show higher mean values in almost all the anthropometric traits than male brickfield labourers, but the differences are significant only in case of stature, calf and chest circumferences, biceps, triceps, and subscapular skinfolds. In females, agricultural labourers show higher mean values in most of the traits than brick field labourers but the differences are not significant except for antero-posterior chest diameter.

Table 2 shows the descriptive statistics of somatotype components of male and female labourers working in agriculture and brickfield. All the individuals, irrespective of sex and occupation, show higher ectomorphic component than endomorphic component. No statistically significant differences were observed in any of the comparisons. All the individuals irrespective of sex and occupation belong to mesoectomorphic region.

Table 3 shows the descriptive statistics of systolic and diastolic blood pressure, pulse rate, and haemoglobin level of agricultural and brick field labourers separately for sexes. Male agricultural labourers, show higher mean values of all the traits compared to brickfield labourers but a significant difference lies only in case of haemoglobin level. A similar trend is observed in case of females as that of males but the differences were not statistically significant. Moreover, the haemoglobin level in all the individuals was below the normal category [38].

Table 4 shows the classification of age and selected health traits, namely, BMI, haemoglobin, and blood pressure of the studied individuals. Majority of individuals belong to age group 21–30. Result shows that majority of individual are underweight (BMI), especially mild thin, irrespective of sex and occupational status. Majority of the males of both the occupational groups were categorized under "mild anaemic," whereas majority of females of both occupational groups were categorized under "moderate anaemic" in terms of haemoglobin level. Blood pressure category reveals that

majority of agricultural labourers of either sex are prehypertensive, whereas majority of brickfield labourers of either sex have normal blood pressure.

4. Discussion

The present study aims to investigate the differences in selected health traits between two occupational groups, namely, agriculture and brickfield. The individuals of both groups were homogenous in terms of ethnic/genetic traits, physical environment, and socioeconomic condition. Health status was measured in terms of few anthropometric traits, blood pressure, pulse rate, and haemoglobin level. The test protocols were similar for all the individuals under study. Results show an overall poor health condition of the labourers in both occupational groups.

Mean values of anthropometric traits show relatively greater values among agricultural labourers in almost all the traits than among brickfield labourers. The values are relatively poorer than those observed in other indigenous populations of India, as well as of West Bengal [40, 41]. Somatotype components of either sex show no statistically significant difference of the occupational groups. But the value of ectomorphic component is higher in all the individuals, an inevitable characteristic of manual labourer [42, 43]. The values of X and Y indicate that all the individuals can be plotted in the ecto-meso region of somatotype chart (not presented). This finding is corroborative with the study of Roy [44], where ectomorphic component was predominant in both high and low tea leaf pluckers irrespective of sex.

BMI values show that majority of individuals are underweight and especially mild thinness is prevalent irrespective of sex and occupational status. This finding corroborates with the study of Mittal and Srivastava [45], where prevalence of undernutrition, especially mild thinness was higher for both Oraon male, and females. Among Oraon males of Jharkhand, engaged in both agriculture and wage earner jobs, higher prevalence of undernutrition [46] and mild thinness was also reported [47]. Bigoniya and colleagues [28] also reported majority of gardeners of Bhopal city were underweight. Prevalence of underweight is high among the tea garden labourers of Assam [22, 48]. London et al. [49] also reported high level of undernutrition (low BMI values) among the farm workers of Western Cape. Therefore, the present study shows the same trend as of earlier studies in case of BMI values.

Considering haemoglobin level of the occupational groups, majority of males show mild anaemic status, whereas majority of females of both occupational groups were moderate anaemic. Female agricultural labourers failed to show normal haemoglobin level. This finding is corroborative with the findings of Medhi et al. [22] for Assam tea garden labourers.

Mean values of systolic and diastolic blood pressure and pulse rate of either sex are higher in case of agricultural labourers than in case of brickfield labourers. Blood pressure category reveals that, majority of brickfield labourers of either sex have normal blood pressure but majority of agricultural labourer of either sex were pre-hypertensive. The high prevalence of prehypertensive individuals was also reported in the studies of Medhi et al. [22] and Mahanta and colleagues [50] among the tea garden labourers of Assam.

However, health status of the two occupational groups under study shows more or less similar values in terms of the variables considered, which may perhaps be related to the high demand of physical activity in such jobs (occupations). Such result is expected in many high physical activity demanding jobs; the truth is verified with the statement of House et al. [51] and Karasek et al. [52] which states that each particular occupation has its own set of demands and rewards that can influence health.

5. Conclusion

The result obtained in the study is not sufficient to make some general remarks, because the differences in health traits were not significant in all the traits between groups and even the trends of mean values were not consistently high in any particular group. But many studies revealed the existence of such differences. Therefore, more studies across communities and occupations with rigorous study design and proper sample size should be necessary to get more meaningful insights into the facts.

Authors' Contribution

Both the authors participated in study design, data analysis and writing of the paper. Subrata K. Roy collected the field data for the present study.

Conflict of Interest

No author had any financial or personal conflict of interests with the organization supporting the research.

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