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Study of Musculoskeletal Disorders and Selected Biochemical Parameters in Brick Field Workers

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Abstract

The brick field industry is an unorganized sector of work in India. The heavy physical workloads, long duration of work and awkward posture of these workers make them prone to musculoskeletal disorders. They also suffer from other health problems. So, the present study was done with the aim of studying the prevalence of musculoskeletal pain among brick field workers (n = 121) of a brick field of Kalyani, West Bengal, using the Standardized Nordic Questionnaire. Moreover, biochemical parameters such as the random blood glucose levels and HbA1c levels were also estimated using standardized methods, since earlier studies have indicated a negative impact of raised glycemic indicators on musculoskeletal disorders. Results obtained showed that the lower back, neck and legs were the common sites of musculoskeletal pain in the brick field workers. Those brick field workers who reported musculoskeletal pain were also found to have significantly ($p < 0.001$) higher random blood glucose levels and HbA1c levels than the brick field workers who did not report musculoskeletal pain. Medical treatment of musculoskeletal pain and interventions to facilitate optimization of blood glucose control is suggested to promote better performance by the brick field workers in physical tasks related to the brick field industry.

Key Words: Blood glucose, Brick field, HbA1c, Musculoskeletal Pain, Workers, Prevalence

Introduction

Evidences suggest that people in almost every occupation are affected by musculoskeletal disorders (MSDs). Broad spectrum of inflammatory and degenerative disease states causing impairment in body functions, limiting movements, and promoting pain in various body parts such as neck, back, shoulders, elbow, hands and wrists are referred as MSDs [1]. In the present era of globalization and industrialization, MSDs have become a common health problem, negatively impacting the productivity and work capacity

of an individual[2]. Links between MSDs and diabetes has also been shown by earlier studies[3,4]. Uncontrolled blood glucose may lead to damage to nerves and tissues, causing musculoskeletal disorders. Diabetes is a major contributor of mortality worldwide and have several health complications such as neuropathy, retinopathy, nephropathy, slowed wound-healing and cardiovascular diseases[5]. Workers working in a workstation for several hours are susceptible to ergonomic-related ill effects on health, which often facilitate MSDs. The brick field workers work station is the brick field. In this workstation, the brick field workers, who are daily wage workers perform physical laborious work for long hours without sufficient break. They intake improper energy deficient diet. They maintain poor working postures, carry out digging of clay and lifting of heavy loads. Furthermore, they bend, push and pull heavy loads or carts. These movements are generally repetitive in nature and contributes to the occurrence of work-related musculoskeletal injuries/musculoskeletal disorders or symptoms. Hence, the present study was carried out to explore the musculoskeletal problems and glycemic indicators in brick field workers.

Material and Methods

The study was conducted among brick field workers of a brick field of Kalyani, West Bengal. In this cross-sectional study, 121 subjects were randomly selected as participants. The study included subjects who did not have any history of major disease, no obvious signs of weakness/disability, and were of comparable age groups. Subjects who had major disease or were unwilling to participate in the study, and were working for less than one year, were excluded from the study. The study was conducted according to Helsinki declaration and had institutional ethical committee permission. Informed consent was also obtained from all subjects prior to the starting of the study.

Body mass index (BMI) was determined using the recorded height and weight of the subjects, employing the standard protocol of Weiner and Lourie [6]. Height of the subjects were measured with the help of a measuring scale with 0.1 cm division value and the wight was measured with a portable weighing machine.

The Musculoskeletal complaints data were collected employing the Standardized Nordic Questionnaire for the Analysis of Musculoskeletal symptoms (NMQ)[7]. The subjects were questioned regarding pain in body regions like - neck, shoulder, upper back, lower back, upper extremities and lower extremities.

Data on parameters such as age, sex, weight, height, dietary know how, musculoskeletal pain and related factors were collected.

Blood samples from all the subjects were collected aseptically from the antecubital vein. The sera were analysed for glycosylated haemoglobin, and blood glucose using an autoanalyser (Roche Diagnostics, Modular P-800, Germany).

All the collected data was statistically analysed with appropriate statistical packages. The values were expressed as percentages or mean and t-test was performed when necessary to determine the significance. The statistical significance was assumed at $P < 0.05$.

Results and Discussion

A total of 121 subjects were included in the study. Mean age of the subjects was 26.23±1.81 years. Mean BMI of the subjects was 19.48±1.48 kg/m². The present study showed that more than half (54.5%) of the subjects experienced musculoskeletal pain either at single or multiple sites of the body (**Table 1**).

Table 1: Profile of Study Participants (n=121)

Characteristics	No. of subjects (n= 121)
Mean Age :	26.23±1.81
Sex: Male Female	 41 (33.9 %) 80 (66.1%)
Mean BMI:	19.48±1.48 kg/m²
Musculoskeletal Pain: Yes No	66 (54.5%) 55 (45.5%)

The prevalence of MSD symptoms in the subjects in the last 7 days and the last 12 months have been presented in **Table 2**. The prevalence of low-back pain and neck pain were the higher than other body parts in the last 7 days as well as last 12 months. This was followed by leg pain. In other words, lower back, neck and legs were the most common sites of musculoskeletal pain reported by the subjects.

Table 2: Prevalence of MSD symptoms in different body parts *(n=121)*

	7 days N (%)	12 month N (%)
Neck	47 (38.8)	62 (51.2)
Shoulder	18 (14.9)	23 (19.0)
Upper back	10 (8.3)	16 (13.2)
Lower back	48 (39.7)	83 (68.6)
Leg	46 (38.0)	59 (48.8)

A previous study conducted in brick field workers of West Bengal found severe pain to be dominant, especially on the lower back and neck [8]. The same trend was observed in the present study. Another study from West Bengal also concluded that brick field workers were suffering from work-related pain in different body parts[9]. However, a scope of getting broad differences in the findings concerning occupation-related musculoskeletal disorders prevails because of reasons like - lack of globally followed definition of MSDs, the employment of variety of criteria such as medical examination or self-reported

measures for the diagnosis of MSDs. Moreover, the findings may also vary between different populations.

The **Table 3** shows the studied serum biochemistry parameters categorized by the status of musculoskeletal disorders. It shows that the random blood glucose level and HbA1c level of the subjects with MSDs were significantly ($p < 0.001$) higher than compared to subjects without MSDs.

Table 3: Selected serum biochemistry parameters categorized by the status of musculoskeletal disorders

Parameters	Musculoskeletal Disorders (MSDs)		t-value	p-value*
	Present Mean±SD	**Absent** Mean±SD		
Random blood glucose (RBG)	8.328±5.98	5.25± 4.98	6.233	0.001*
HbA1c (Glycosylated hemoglobin) level	8.62±2.5	5.10±3.73	2.736	0.001*

The values of RGB are in mmol/l , and the values of HbA1c levels are in percentage.
*=Significant

A random venous blood glucose >200 mg/dL (11.1 mmol/L) indicates that the subject is diabetic[10]. However, in the present study, the RBG levels of subjects with MSDs and subjects without MSDs were well below the level of diabetes. However, the RBG levels were significantly ($p < 0.001$) higher in subjects with MSDs when compared to the RBG of subjects without MSDs. The workers employed in brick field belongs to the very low income group section of the society. In the study, it was found that, due to extreme poverty, on most of the days the brick field workers were compelled to have one-time meal, which generally comprises 750gm to 1000gm of wet rice with onion, salt and chilly, and so they are malnourished. Malnutrition makes them achieve a very thin body stature and become underweight. Blood glucose is metabolized into pyruvic acid. The latter on reacting with oxygen forms carbon dioxide, water and energy ATP (adenosine triphosphate). Having lower blood glucose level promotes exhaustion or fatigue, impairing working capacity. Hence, a diet having sufficient amount of carbohydrates is an absolute essential for performing laborious physical work of a brick worker. Investigating the brick field worker's dietary know how revealed that in the evening, they often consume Hadia, a homemade alcohol, around 200-300 ml at least, which might have affected the random blood glucose level obtained in the study. Since they are malnourished, it is most likely that they might have had a much lower blood glucose level in reality than found in this study. Hence, a study of their fasting blood glucose level is warranted to reach a fair conclusion. Although musculoskeletal disorders are not diabetes specific, in recent times their

occurrence has been found to be more in subjects with diabetes[3,4]. Therefore, diabetes should always remain under check to make the population healthy and disease free. Diabetes which is one of the prime risk factors for developing cardiovascular disease and cardiovascular deaths[11] may predispose the subject to musculoskeletal diseases by several ways such as by enhancing the glycosylation (non-enzymatic) of proteins and yielding advanced glycation end product (AGE), by causing greater proliferation of myofibroblast which may lead to greater deposition of connective tissue, by inducing vascular insufficiency, neuropathy, autoimmune diseases like rheumatoid arthritis[12,13]. Thus, poor glycaemic control may adversely affect musculoskeletal system.

The glucose molecules attaches with the haemoglobin of red blood cells to form glycated haemoglobin, which is a measure of the average glucose level in the subject's blood. The HbA1c levels acts as a marker for long-term glycemic control. In view of above fact, it seemed necessary to evaluate the HbA1c levels in brick field workers as HbA1c levels are linked to blood glucose levels, which in turn impacts musculoskeletal health. In the present study, the HbA1c levels were significantly ($p < 0.001$) higher in subjects with MSDs than in subjects without MSDs. This was an expected finding, which points out the association between RBG levels and HbA1c levels. It may be interpreted to mean that a good (< 6%) HbA1c may restrict the development of musculoskeletal diseases and a poor (> 6 - 9% or more) may predispose the subjects to musculoskeletal diseases. These cut-off values of HbA1c levels are in line with other studies[14]. Elevated HbA1c levels also increases the risk for diabetic dyslipidemia[15], stroke and coronary heart disease (CHD)[16,17]. All of these facts makes the monitoring of HbA1c levels important for not only uplifting musculoskeletal health, but also for safeguarding overall health.

Conclusion

The most common site of musculoskeletal pain among the brick field workers of the present study was lower back, neck and legs. The fasting blood glucose level and HbA1c level was also significantly more in those brick field workers who were suffering from musculoskeletal disorders. The health of the brick field workers were not up to the mark and this may hamper their physical task performing ability, thereby decreasing the productivity. Health checkups at regular intervals and necessary medical interventions to combat musculoskeletal pain and interventions to promote optimal blood glucose levels are warranted to ensure good heath among the brick field workers, which will boost working capacity as well as productivity of the brick field workers and benefit the brick field industry.

Authors' Contribution

Conception, design : RK and RM.

Data collection, Analysis, interpreting the data, statistical expertise and drafting: RM.

Critical revision of the article for important intellectual content, final approval of the article and provision of study materials : RK and RM.

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Conflicts of interest

There are no conflicts of interest.

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