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POSTURES ADOPTED AND PERCEPTION OF MUSCULOSKELETAL PAIN OF WORKERS AT JEWELLERY MAKING WORKSHOPS IN GUJARAT

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ABSTRACT

Background: Workers engaged in jewellery manufacturing are exposed to various occupational risk factors that lead to the development of musculoskeletal disorders. Objectives: *To study the postures adopted by workers engaged in jewellery making activity. *To assess the musculoskeletal disorders of respondents engaged in jewellery making activity. Methodology: Field survey was conducted on 80 respondents selected purposively from Rajkot (40) and Ahmedabad city (40). Results: Data revealed that respondents spend 10 - 12 hours per day in jewellery making activity and in poor posture. Majority of respondents revealed the symptoms of pain at neck, shoulder, arm, back and knee. Conclusion: The tasks carried out were in awkward postures for long durations with repetitive and forceful motions which led to the development of musculoskeletal pain among these workers.

Keywords: Jewellery making, Working Posture, RULA, Musculoskeletal Disorders.

INTRODUCTION

Jewellery making is one of the world's oldest manufacturing operations and has always involved some hazardous processes **[1].** Jewellery manufacturing activities involves precision design, setting the tiny metals and stones which require high visual attention and mental concentration and are often near - point task **[2].**

Preventing workers from occupational diseases, creating a healthy and reliable work environment are one of the most important issues in these days. If the working conditions are accustomed properly for the physical and mental working of someone, physical working is going to support the health and raise the performance. Otherwise, occupational diseases will appear and the performance of the employee is going to decrease **[3].** As mentioned above, jewellery manufacturing activity involves various precision designs such as setting the metal as well as the stones, polishing and filing. At every stage of manufacturing, checking the quality of the product is very important. As any rework increases the labor cost and material cost, workers need to pay high attention towards the quality of the product **[1].**

Jewellery making process is sedentary in nature and requires prolonged sitting occupying the same posture. There are various studies available, which report that risk factors are present for developing the MSDs, (Musculoskeletal Disorders) at the workplace of jewellery manufacturing **[4].**

The present study focuses on the problem of jewellery makers 'occupational health hazards'.

The purpose of the present study is to find out the health related issues among jewellery makers during work, with special reference to musculoskeletal disorders. The findings of the study will provide: Data for researchers and jewelers' for formulating future strategies improve posture and prevent musculoskeletal disorders of the workers engaged in the organized and unorganized sectors of jewellery making. 2. The study can provide useful data for manufacturers of equipment to design ergonomically sound tools for jewellery making workers to reduce their postural load and repetitive movements.

OBJECTIVES

*To study the postures adopted by workers engaged in jewellery making activity.

*To assess the musculoskeletal disorders of respondents engaged in jewellery - making activity.

METHODOLOGY

The research methodology adopted for conducting the present study was based on ergonomic problems during jewellery making.

The present study was conducted in one phase i.e. field survey. For the field survey, a sample consisting of 80 workers of Gujarat state engaged in jewellery making activity were

randomly selected from the cities of Rajkot (40) and Ahmedabad (40). Respondents who perform these activities almost daily were selected purposively.

Data was collected through interview schedule cum observation method. The background information and specific information about the activity was sought from the respondents by personal interview method. The postures adopted by them were noted down by observation method.

Background information covered the socio-demographic characteristics of the selected respondents (age, educational qualification, working time, break time and work experience at the current job). Specific information included their job profile and postures adopted while performing jewellery making activity and musculoskeletal problems faced by them.

A low cost tool was used to examine musculoskeletal disorders among the respondents. This was Rapid Upper Limb Assessment (RULA) developed by McAtamney and Corlett (2004) which focuses mainly on upper limb disorders and Body Mapping technique (perceived exertion). For RULA only 40 subjects could be included in the study based on willingness and time constraints.

According to the symptoms and type of pain, relevant musculoskeletal disorders were identified. Responses of the subjects were noted on a record sheet which contained the symptoms of musculoskeletal disorders associated with this activity using personal interview method and perceived exertion (P.E.) chart.

Mean scores were calculated. Frequencies and percentages were also calculated for analysis of data regarding musculoskeletal disorders.

RESULTS AND DISCUSSION

Age: Age is a very important variable in an occupational study as it affects the working capacity of an individual. Out of the total workers selected for the present study, maximum number of the respondents i.e. **53%** belonged to the age group of 18-32 years while **40%** belonged to the age group of 33-47 years. These results show that the people who are occupied with this job were the young population. **Education:** When we look at the educational background of the workers, 45**%** of them had studied up to higher education and **26%** up to primary school and their equivalents. This situation shows that the great majority of the workers had moved towards this occupation after higher education. **Work and Break Duration:** Data also shows the working hours the workers engaged in jewellery making. Fifty nine per cent **(59 %)** of the workers worked more than 11hour, forty one per cent **(41%)** of them worked for upto 10 hours. Maximum **93%** of break duration taken by the workers was of three hours whereas seven **(07%)** per cent of the workers took a break of less than or equal to two hours.

Table-1: Socio – personal profile of the selected respondents (N = 80)

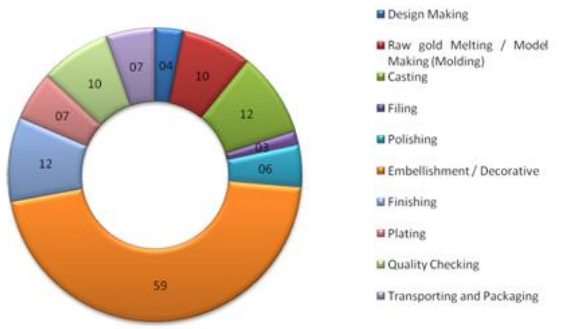
Personal details	Group	Number	Percentage (%)
Age (years)	18-32	42	53
	33-47	32	40
	48 & above	06	07
	Total	**80**	**100**
Average age ≥ 32.78			
Education	Primary	21	26
	Secondary	07	09
	Higher Secondary	36	45
	Graduation	13	17
Total		**80**	**100**
Working time (in hrs.)	5-10	33	41
	11 & above	47	59
Total		**80**	**100**
Break time (in hrs.)	1-2	74	93
	2 & Above	06	07
Total		**80**	**100**

Table-2: Work experience of the respondents (N=80)

Years	Number	Percentage (%)
2 - 5 years	18	23
6 - 10 years	9	11
11 - 15 years	22	27
16 - 20 years	13	16
21 - 25 years	8	10
Above 25 years	10	13
Total	80	100

Table 2 gives the work experience of the respondents. When the respondents were asked about their experiences in performing the activity **27%** of them reported that they had been performing this activity since 11 to 15 years, sixteen **(16%)** per cent had more than fifteen years of experience and only **13%** of them had more than 25 years of experience in performing the activities of jewellery making.

(N=80)



Note: Multiple responses.

Figure-1 Gold Jewellery Making Respondents (Job profile)

Plate-1 Working postures adopted by the jewellery makers at work (n=40)

Figure 1 shows that maximum (**59%)** of the respondents were engaged in 'Embellishment/Decorative' Gold jewellery. Twelve per cent **(12%)** and ten per cent **(10%)** of the respondents were engaged in 'Casting' & 'Finishing' and 'Raw gold melting' / 'Model Making (Molding)' respectively. In 'Quality Checking' activity ten per cent **(10%)** of the respondents were involved. Only three per cent **(03%)** of the respondents were engaged in for 'Filing' in Gold jewellery making.

Table-3: Assignment of RULA scores according to position of body part

RULA Score	Action	Number of respondents	Percentage (%)
1-2 =	Acceptable posture	00	00
3-4 =	Further investigation, change may be needed	33	82
5-6 =	Further investigation, change soon	06	15
7+	Investigate and implement change	01	03
Total		40	100

Percentage of workers under RULA level

Photographs of selected workers performing their work at the jewellery making workshop is shown in Plate 1. Critical analysis of the photographs was carried out and RULA score was calculated. The results of the posture analysis using RULA are shown in Table 3. About 82 % of the workers are at low risk level and change may be needed whereas 15% workers were found at medium risk a level which needs to be investigated further and changed soon. Around three percent (03%) of the workers were working investigate and implement change area.

These results reveal that all categories of the risk levels exist in the job postures of jewellery making workers. Further investigation with an immediate change was recommended to most of these workers. The table also shows that none of the workers were in the negligible risk level i.e. acceptable posture.

Details of the working position adopted by the respondents while performing activities related to jewellery making can be observed from Table 4.

Table-4: Type of working position during sitting and standing at work.

Position	Number	Percentage (%)
	Sitting	**(N=80)**
I. With proper backrest *(Blue print designing, CAD designing, Wax designing, Diamond assortment, Quality checking, Entry in stock, Packaging, Embellishment / decorative)*	75	94
Without proper backrest	05	06
II. Without proper backrest *(Master casting model, Rubber Diamond assortment, Wax setting ,Casting, Polishing, Plating, Filling, Embellishment / decorative, Finishing)*	76	95
With proper backrest	04	05
III. On stool *(Polishing, Plating)*	19	24
IV. On table *(Finishing)*	09	11
V. On mattress *(Diamond assortment , Embellishment / decorative)*	71	89
VI. Any other *(Blue print designing, CAD designing, design making)*	06	07
Standing (n = 25)		
VII. One leg supporting *(Casting)*	01	04
VIII. Even standing *(Casting, Finishing)*	21	84
IX. Uneven standing *(Casting)*	03	12

Note: Multiple Responses, Multiple tasks.

About **94%** of the sitting respondents position during these activities were 'with proper backrest', whereas **95%** also sat 'without proper backrest' based on the activity performed. Singh (2007) reported that a formal sitting position is undesirable to hold for a very long period because it increases the load on musculature supporting the head and it produces muscular pain in the neck and small portion of the back. The table also depicts that **89%** of the respondents' sit on 'mattresses' provided by the employers. Twenty four per cent and eleven per cent sat on 'stool' and 'table' respectively. Only seven per cent **(07%)** of them used a 'chair' for their work activity.

Amongst the workers who performed the activity of jewellery making in standing position, it was found that 84% of the respondents used the 'even standing' position which is a balanced position whereas 12 per cent of them carried out the task in 'uneven standing' position. According to Saha (1990) poor or faulty body position may lead to permanent body damage besides increasing the cost of work. **(N=80)**

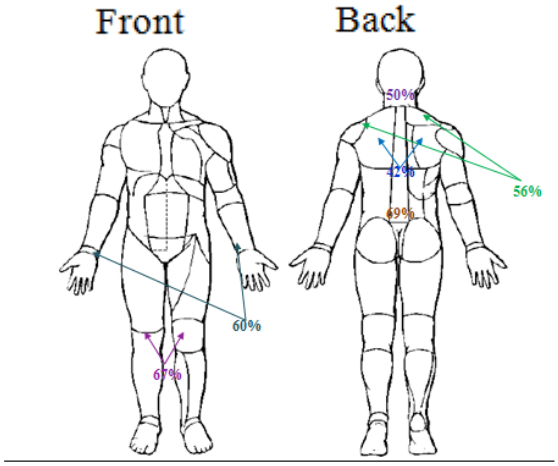


Figure 2 Survey locations of Musculoskeletal Disorder symptoms (Perceived Exertion)

Note: Multiple responses.

Figure 2 shows the location of musculoskeletal disorder symptoms as felt by the workers. Regarding the musculoskeletal disorders perceived by jewellery makers in different body parts, maximum pain was found to be **69% as** low back pain while **42%** respondents' complained about upper back pain. Fifty six per cent **(56%)** and fifty per cent **(50%)** indicated pain in the Neck and Shoulder, respectively. Sixty seven per cent **(67%)** and **60%** respondents' complained about Knee pain and arm pain, respectively. It can be seen that low back pain, knee and arm pain were reported by a high percentage of workers.

CONCLUSION

Evaluation of body posture was carried out in jewelry making workshops by RULA and Perceived exertion tools. Very low percentage of workers was under high risk of musculoskeletal disorders as determined from RULA risk level.

Workers engaged in jewellery making activity need to adopt awkward postures due to long

durations of their work. They perform the activity with repetitive and forceful motions. Prolonged sitting at different body positions was also noted by the investigators. This led to the development of musculoskeletal pains among these workers. In contrast RULA score did not indicate poor posture in majority of the workers. These pains, if ignored at an early stage can lead to musculoskeletal disorders later on.

The present of musculoskeletal pain indicates that there is a need for ergonomic intervention among the jewellery - making workers.

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