Chapter 4
Results and Discussion

Chapter – 4

Result and Discussion

This chapter deals with the description and discussion of the results of the study. The major objective of the study is to ergonomically assess the occupational Health hazards faced by HCWs. The entire analysis was done on the basis of types of Health care workers for meaningful presentation. Thus the whole sample was divided into two groups i. e·Ward boys and Nurses. On the whole there are 56.66 percent nurses and 43.33 percent wardboys.

Findings of study are introduced through composite frequency and percentage tables followed by the statistical applications for the testing of hypotheses and relevant discussion pertaining to various objectives of the investigation. Result and discussion of the study are presented under following sections:-

Section I: General Information

Section II: Nature of work carried out by HCWs.

Section III: Data on medical History of selected HCWs.

Section IV: Work Related injuries and health hazards faced by HCWs while working in hospital.

Section V : (1) Musculoskeletal symptoms experienced by HCWs

(2)Musculoskeletal symptoms experienced by HCWs while performing different patient handling tasks and non-patient handling tasks.

Section VI: Anthropometric measurements and furniture/ equipment dimensions

Section VII: Psychological cost of work.

Section VIII: Physiological cost of work.

Section IX: Testing of Hypotheses.

Section X: Guidelines for reducing occupational health hazards

Section I

General Information

This Section of the study deals with the description of the general information on Health care workers and their work. For the present study worker related variables were age, education, height, weight, Body Mass Index (BMI), marital status and work related variables were working hours, years of working, work schedule, number of patients assisted by health care workers. Health care workers working in government hospital were the key respondents for the present study.

Health care worker related aspects (Table 4.1.1)

1. **Age (Years)**

The mean age of HCWs was 43.16 years. The age ranged between 31-56 years. More than 50 percent i. e 56.66 percent HCWs were in the age group of between 41-50 years. About 34 percent were in the age group of 31-40 years and only 10 percent of HCWs belonged to the age group of 51-60 years. Majority of ward boys i.e. 69.23 percent were in the age group 41-50 years whereas 52.94 percent nurses were in the age group 31-40 years

2. **Educational Level**

Out of the total HCWs 40 percent passed high school, another 40 percent passed Intermediate, very few of them i.e. 6.66 percent were post graduates. Among ward boys 69.23 percent were having high school certificate and 30.76 percent had education up to Intermediate. On the other hand, among nurses 11.76 percent were post graduates, 23.52 percent were graduates 47.05 percent had education up to intermediate and 17.64 percent were high school. None of the ward boys were graduate postgraduates.

3. Marital Status

Majority of the HCWs were married. Ninety percent of HCWs were married and 10 percent were unmarried. Among wardboys 92.30 percent were married whereas 88.23 percent nurses were married.

4. Height

The mean height of selected HCWs was 156.6 cm. Height of the HCWs ranged from 120-170cm. About 37 percent HCWs had height of 161-170cm where as, only 3.33 percent had height of 161-170 cm and 15.38 percent had height in the range 141-150 cm. In nurses 35.29 percent had height of 151-160 cm and few nurses i.e. 3.33 percent were of height below 130 cm.

5. Weight

The mean weight of selected HCWs was 58.53 kg. Sixty percent HCWs had weight of 51-60 kg and very few of them i.e. 3.33 percent were of weight 71-80 kg. In both the groups of HCWs i.e. ward boys and nurses majority (76.92 and 47.05 percent) had weight between 51-60 kg.

6. Body Mass Index (BMI)

The results of the study showed that 63.33 percent HCWs had ideal BMI, only 6.66 percent were obese. About 70 percent wardboys had ideal BMI, 15.38 percent were under weight another 15.38 percent were over weight. None of the wardboys were obese. On the other hand among nurses 58.82 percent had ideal BMI, 11.76 percent were obese and 5.88 percent were under weight.

Table 4.1.1 General information related to HCWs

S.no	General Information	Health Care Workers (HCWs)		
	Worker related aspects	Ward boys n=52	Nurses n= 68	Total HCWs N=120
1	**Age (Years)**			
	20-30	-	-	-
	31-40	4 (7.69)	36 (52.94)	40 (33.33)
	41-50	36 (69.23)	32 (47.05)	68 (56.66)
	51-60	12 (23.07)	-	12 (10.00)
	Mean	48.73	43.55	43.16
2	**Educational Level**			
	High school	36 (69.23)	12 (17.64)	48 (40.00)
	Intermediate	16 (30.76)	32 (47.05)	48 (40.00)
	Bachelor's degree	-	16 (23.52)	16 (13.33)
	Master's Degree	-	8 (11.76)	8 (6.66)
3	**Marital status**			
	Single	4 (7.69)	8 (11.76)	12 (10.00)
	Married	48 (92.30)	60 (88.23)	108 (90.00)
4	**Height (cm)**			
	120-130	-	4 (5.88)	4 (3.33)
	131-140	-	4 (5.88)	4 (3.33)
	141-150	8 (15.38)	20 (29.41)	28 (23.33)
	151-160	16 (30.76)	24 (35.29)	40 (33.33)
	161-170	28 (53.84)	16 (23.52)	44 (36.66)
	Mean	160.19	152.94	156.60
5	**Weight (kg)**			
	40-50	-	8 (11.76)	8 (6.66)
	51-60	40 (76.92)	32 (47.05)	72 (60.00)
	61-70	12 (23.07)	28 (35.29)	36 (30.00)
	71-80	-	4 (5.88)	4 (3.33)
	Mean	58.69	58.41	58.53

Cont....

S.no	General Information	Health Care Workers (HCWs)		
	Worker related aspects	Ward boys n=52	Nurses n= 68	Total HCWs N=120
6	**Body Mass Index (kg/cm)**			
	Under Weight (<20)	8(15.38)	4 (5.88)	12 (10.00)
	Ideal (20-25)	36 (69.23)	40 (58.82)	76 (63.333)
	Over Weight (25-30)	8 (15.38)	16 (23.52)	24 (20.00)
	Obese (>30)	-	8 (11.76)	8 (6.66)

Work related aspects of HCWs

1. Work schedule

It was found that the majority (76.66 percent) HCWs selected for the present study work in morning shift at the time of study and very few i.e. 6.66 percent work in other type of shift. In wardboys 61.53 percent and in nurses 88.23 percent work in morning shift and very few worked in other type of shift i.e. 12 hrs and 24 hrs shift.

Table 4.1.2 General information on work related aspects of HCWs

S.no	General Information	Health Care Workers (HCWs)		
	Work related aspects	Ward boys n=52	Nurses n= 68	Total HCWs N=120
1	Work Schedule			
	Three Shifts			
	Morning	32 (61.53)	60 (88.23)	92 (76.66)
	Evening	12 (23.07)	8 (11.76)	20 (16.66)
	Night	-	-	-
	Other Type	8 (15.38)	-	8 (6.66)

Cont....

S.no	General Information	Health Care Workers (HCWs)		
	Work related aspects	Ward boys n=52	Nurses n= 68	Total HCWs N=120
2	Working Hours			
	6 hrs	40 (76.92)	68 (100.0)	108 (90.00)
	12 hrs	8 (15.38)	-	8 (6.66)
	24 hrs	4 (7.69)	-	4 (3.33)
3	Years of work			
	0-10	18 (34.61)	28 (41.17)	46 (38.33)
	11-20	14 (26.92)	16 (23.52)	30 (25.00)
	21-30	20 (38.46)	24 (35.29)	44 (36.66)
4	Average number of patients assisted by HCWs per day	41.15	26.00	32.50
5	Average number of patients admitted per day	-	-	45.40

2. Working Hours

Out of the total majority of HCWs i.e. 90 percent worked for 6 hrs/day and only 3.33 percent worked 24 hrs/day. The result of the study showed that all nurses worked for 6 hrs/day, wheras76.92 percent wardboys worked for 6 hrs/day, 15.38 percent worked for 12 hrs/day and 7.69 percent worked for 24 hrs/day.

3. Years of working

It was noted that 38.33 percent HCWs had working experience between 0-10 years, 36.66 percent had between 21-30 years and 25 percent had between 11-20 years. About 39 percent wardboys had working experience between 21-30 years where as 41.17 percent nurses had working experience between 0-10 years.

4. Number of patients assisted by HCWs

The data collected showed that approximately 42 patients were assisted by wardboys whereas, approximately 26 patients were assisted by nurses while working in hospital.

Table 4.1.3 General information on work place of HCWs

S.no	General Information	Health Care Workers (HCWs)		
		Ward boys n=52	Nurses n= 68	Total HCWs N=120
I	**Work place**			
	Medicine ward	8 (15.38)	16 (23.52)	24 (20.00)
	Surgery ward	8 (15.38	20 (29.41)	28 (23.33)
	Operation Theatre	4 (7.92)	8 (11.76)	12(10.00)
	Out patients	4 (7.92)	12 (17.64)	16 (13.33)
	Pediatrics	4 (7.92)	-	4 (3.33)
	Intensive care unit	4 (7.92)	-	4 (3.33)
	Orthopedics	4 (7.92)	4 (5.82)	8 (6.66)
	Gynecology	4 (7.92)	4 (5.82)	8 (6.66)
	Any other	4 (7.92)	4 (5.82)	8 (6.66)

5. Work place

It was found that of 29.41 percent nurses selected for the present study worked in surgery ward at the time of interview, 23.52 percent worked in medicine ward, 17.64 percent nurses worked in out patient unit, 11.76 percent worked in operation

theatre, 5.82 percent worked in orthopedics department, another 5.82 percent worked in gynecology department and another 5.82 percent worked in other departments like ENT department and dental department. On the other hand 15.38 percent wardboys worked in medicine ward, another 15.38 percent worked in surgery ward department, 7.92 percent worked in pediatrics department, 7.92 percent worked in outpatient unit, 7.92 percent worked in gynecology department and another 7.92 percent worked in intensive care unit and another departments.

From the results of the section 1 it was concluded that HCWs were in middle age group. Majority of the HCWs were married, have ideal Body Mass Index. Most of the HCWs selected for the present study work in morning shift (6hrs) at the time of study. Most of HCWs worked in medicine ward and surgery ward at the time of study.

Section II

Nature of Work Carried out by HCWs

Health care is a labor intensive industry and it covers a highly diversified range of activities like the workers who provide emergency medical service have unique nature of their work where as medical technician perform different types of work (Engles, 1994; Sadik, 1999). There is also difference in activities carried out by nurses and wardboys (Levy, 1988). The result of the present study showed that the HCWs perform two types of tasks i.e. patient handling tasks and non-patient handling tasks. The nature of work carried out under these two tasks by HCWs are presented in table 4.2.1.

Patient Handling tasks

This includes activities performed by HCWs in hospitals in which they are in direct contact with patients like patient handling in bed, dressing of patient's etc. It was found that more than 70 percent of wardboys performed activities such

as moving patient in chair (92.30 percent), rolling a patient from side to side for access when washing or changing on the bed (92.30 percent), transferring a patient (84.61 percent), making a bed with patient in it (84.61 percent), transfer a patient with two members without lifting equipment (76.92 percent), dressing /washing on bed (76.92 percent), lifting a patient from lying to sitting on bed (76.92 percent), and assisting a patient with eating/drinking/taking medicines. On the other hand the tasks which was performed by more than 70 percent nurses were assisting a patient while eating/ drinking / taking medicines (100.0 percent), medical wound care (100.0 percent), adjusting a patients bed during feeding/ sitting etc (94.11 percent), dressing/washing on bed (88.23 percent),making bed with patient in it(85.35 percent), lifting a patient from lying to sitting on bed (76.47 percent), transferring a patient (70.58 percent), and transfer a patient with two members without lifting equipment (70.58 percent).

The tasks which was performed equally by both nurses and wardboys were transfer a patient with one member without lifting equipment (61.33 and 64.75 percent) and the tasks which was performed by less percentage of wardboys and nurses was dressing/washing on commode (7.92 and 11.76 percent) and any other tasks such as assisting patient in social activities, personal grooming etc.

Table 4. 2.1 Nature of work carried out by health care workers (HCWs)

S.no	Nature of work	Health Care Workers (HCWs)		
		Wardboys n=52	Nurses n= 68	Total HCWs N=120
A	**Patient Handling Tasks**			
1	Moving patient in chair	48(92.30)	32 (47.05)	80 (66.66)
2	Washing in bath	32 (61.53)	44 (64.70)	76 (63.33)

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S.no	Nature of work	Health Care Workers (HCWs)		
		Wardboys n=52	**Nurses n= 68**	**Total HCWs N=120**
3	Rolling a patient from side to side for access when washing or changing on the bed	48 (92.30)	56 (82.35)	104 (86.66)
4	Transfer a patient with one member without lifting equipment	32 (61.53)	44 (64.70)	76 (63.33)
5	Transfer a patient with two member without lifting equipment	40 (76.92)	48 (70.58)	88 (73.33)
6	Dressing / washing on Hoist	4 (7.92)	4 (5.82)	8 (6.66)
7	Dressing / washing on commode	28 (53.84)	28 (41.17)	56 (46.66)
8	Dressing / washing on bed	40 (76.92)	60 (88.23)	100 (83.33)
9	Transferring a patient	44 (84.61)	48 (70.58)	92 (76.66)
10	Lifting a patient from lying to sitting on bed	40 (76.92)	52 (76.47)	92 (76.66)
11	Making a bed with patient in it	44 (84.61)	56 (82.35)	100 (83.33)
12	Assisting in using toilet	40 (76.92)	36 (52.94)	76 (63.33)
13	Assisting with eating /drinking/taking medicines	40 (76.92)	68 (100.0)	108 (90.00)
14	Medical wound care	44 (84.61)	68 (100.0)	112 (93.33)
116	Adjusting patients bed during feeding/ sitting etc	44 (84.61)	64 (94.11)	108 (90.00)
17	Any other	16 (30.76)	28 (41.17)	44 (36.66)
B	**Non patient handling tasks**			
1	Preparation of work surface and organization of meals	32 (61.53)	60 (88.23)	92 (76.66)
2	Collecting equipment e.g. drug trolley, bowls for washing etc.	44 (84.61)	56 (82.35)	100 (83.33)

Cont....

S.no	Nature of work	Health Care Workers (HCWs)		
		Wardboys n=52	Nurses n= 68	Total HCWs N=120
3	Moving furniture i.e. chair, table, bed etc	48 (92.30)	32 (47.05)	80 (66.66)
4	Bed making	44 (84.61)	64 (94.11)	108 (90.00)
6	Writing up patient notes	4 (7.69)	64 (94.11)	68 (56.66)
7	Pulling equipments	44 (84.61)	40 (58.82)	84 (70.00)
8	Other tasks mostly administrative	4 (7.69)	52 (76.47)	56 (46.66)
9	Any other	16 (30.76)	24 (35.29)	40 (33.33)

* Figure in parenthesis represents percentage

Non- Patient handling tasks

This includes activities in which patients are not directly involved but the activities are related to patients only i.e. preparing patients bed, setting drug trolleys for patients etc.

It was noted that more than 70 percent wardboys performed non patient handling tasks such as moving furniture i.e chair, table etc (92.30 percent), collecting equipments e.g drug trolley, bowls for washing, i.v set holding stand etc (84.61 percent), pulling equipments (84.61 percent) whereas more than 70 percent nurses performed tasks such as bed making (94.11 percent), preparation of work surface and organization of meals (88.23 percent), collecting equipments e.g drug trolley and bowls for washing, i.v set holding stand etc (82.35 percent) and other tasks mostly administrative (76.47 percent).

The tasks which was performed by more than 50 percent of wardboys was preparation of work surface and organization of meals (61.53 percent) and the tasks which was performed by more than 50 percent of nurses was pulling

equipments(58.82 percent).It was observed that the tasks which was performed by less percentage of wardboys was writing up patients notes (7.69 percent) , other tasks mostly administrative (7.69 percent) and any other tasks such as dusting etc (30.76 percent) and by nurses was any other tasks such as cleaning equipments, dusting etc(35.29 percent).

It was concluded that the task which was performed by more than 80 percent of HCWs were Rolling patient from side to side for access when washing or changing on the bed, dressing/washing of patient of on bed, making bed with patient in it, assisting patient with eating/taking medicine and adjusting patients bed during feeding/sitting etc. under patient handling tasks and under non patient handling tasks were bed making, collecting equipments e.g. drug trolley, bowls for washing etc.

Section: III

Data on medical history of selected HCWs

1. Medical Background (Table4.3.1)

It was observed that 16.66 percent of selected HCWs were suffering with joint pain, 3.33 percent were suffering from diabetes, and another 3.33 percent were suffering from ruptured discs and hypertension. Among wardboys 15.38 percent were suffering from joint pain and 7.69 percent from ruptured disc where as 17.64 percent nurses were suffering form joint pain, 5.88 percent were suffering form diabetes, and another 5.88 percent were suffering from hypertension. None of the health care workers were suffering from gout, thyroid problems, kidney failure, alcoholism, respiratory problem, arthritis and tendontritis.

Table 4.3.1Data on medical history of selected HCWs

S.no	Medical History	Health Care Workers (HCWs)		
		Wardboys n=52	Nurses n= 68	Total HCWs N=120
1	Health problems			
	Diabetes	-	4 (5.88)	4 (3.33)
	Ruptured disc	4 (7.69)	-	4 (3.33)
	Hypertension	-	4 (5.88)	4 (3.33)
	Any other joint pain	8 (15.38)	12 (17.64)	20 (16.66)
2	Pain or Injury			
	Neck	-	8 (11.76)	8 (6.66)
	Shoulder	4 (7.69)	-	4 (3.33)
	Elbow/Forearm	-	8 (11.76)	8 (6.66)
	Hand/Wrist	4 (7.69)	4 (5.88)	8 (6.66)
	Back	16 (30.76)	24 (35.29)	40 (33.33)
	Hip/Thigh	4 (7.69)	4 (5.88)	8 (6.66)
3	Treatment			
	Anti-inflammatory drugs	16 (30.76)	12 (17.64)	28 (23.33)
	Physical Therapy	-	4 (5.88)	4 (3.33)

Figure in parenthesis represents percentage

The joint pain emerged as a major health problem among HCWs. It was probably due to the fact that HCWs were working for long hours in standing and bending postures. It was also found that 33.33 percent HCWs were suffering form shoulder pain. In wardboys and nurses also majority of them were suffering from back pain and for this pain they were taken anti-inflammatory drugs and rest of them were using physical therapy as a treatment.

2. Back pain/Injury (Table 4.3.2)

The result of the study showed that none of HCWs ever reported a "back" injury at work. Sixty percent HCWs experienced a "back" pain while working in hospital. Out of these 77.77 percent experienced back pain repeatedly and 22.22 percent experienced it for single incident. Mostly this back pain was located in lower back in 83.33 percent of HCWs and in 11.11 percent this pain was located in upper back. It was found that 72.22 percent HCWs experienced limitation in their normal activity due to back pain. More nurses experienced this limitation as compared to wardboys due to their type of work.

Out of these 22.22 percent HCWs missed their work for back pain 50.00 percent missed for one week, 25.00 percent missed for 3 days and another 25.00percent missed for 10 days in a year. About 38.88 percent HCWs those suffering from visited doctor and diagnosed back strain as a caused of this back pain. About 11.11 percent HCWs claimed compensation for their expenditure on the diagnosis of back pain.

It was concluded that majority of HCWs show medical history of joint pain. The back pain was found to be most prominent among HCWs. The cause of this back pain was back strain as diagnosed by the doctor and for this pain the HCWs were taking anti inflammatory drugs as a treatment.

Table4.3.2 Data on back pain/ injury suffered by selected HCWs

S.no	Back pain /injury	Health Care Workers (HCWs)		
		Wardboys n=52	**Nurses n= 68**	**Total HCWs N=120**
1	**Back injury**	-	-	-
2	**Back pain**	20 (38.46)	52(76.47)	72 (60.0)
	Single incidence	4 (20.00)	12 (23.07)	16 (22.22)
	Repeated incidence	16 (80.00)	40 (76.92)	56 (77.77)
3	**Location of pain**			
	Neck	8 (40.00)	32 (61.53)	40 (55.55)
	Upper back	-	8 (15.38)	8 (11.11)
	Lower back	16 (80.00)	44 (84.61)	60 (83.33)
4	**Limitation in work due to pain**	4 (20.00)	44 (84.61)	52 (72.22)
5	**Missed work due to back pain (in an year)**	-	16 (30.76)	16 (22.22)
	3 days	-	4 (25.00)	4 (25.00)
	1 week	-	8 (50.00)	8 (50.00)
	10 days	-	4 (25.00)	4 (25.00)
6	**Back pain checkup**	4 (20.00)	24 (46.15)	28 (38.88)
7	**Diagnosis**			
	Back strain	4 (20.00)	24 (46.15)	28 (38.88)
8	**Worker's compensation**	4 (20.00)	4 (25.00)	8 (11.11)

* Figure in parenthesis represents percentage

Section IV

Work related injuries and health hazards faced by HCWs while working in hospital

1. Injuries and Health Hazards (Table 4.4.1)

Health care workers are exposed to a great variety and concentration of hazards at the work place. They perform a highly diversified range of activities. Although some risks and hazards are common to the whole sector, others are more specific to certain categories of HCWs or to certain work practices of the industry. These hazards could be broadly divided into following categories physiological i.e. biological, chemical, physical, accidental and violence and psychological. Factors such as over crowded health facilities, failure to enforce adherence to universal precautions for infection and regulations governing hospitals which was usually designed to protect patients and not the health care providers are likely to considerably enhance the risk of exposure for health care workers.

Physiological hazards: These hazards could be broadly divided in to following categories:

- **Biological Hazards**

It was found that 15.38 percent nurses suffered form diseases such as syphilis, malaria, tuberculosis, as a result of a prick from syringe, needles etc with in last12 month, 7.69 percent were exposed to blood born pathogens within last 3month and another 7.69 percent suffered from tuberculosis from last 2 years. Collins, (1987); Jagger, (1988); Daviles, (1996) reported in their study that at least 20 different pathognes have been transmitted by needle stick injuries which cause such infections and diseases to HCWs. Where as among wardboys only 5.88 percent

Table 4.4.1: - Work related injuries and health hazards faced by HCWs while working in hospital

S.no	Injuries/ health hazards	1 month		3 months		12 months		Life time	
		Wardboys n=52	Nurses n=68	Wardboys n=52	Nurses n=68	Wardboys n=52	Nurses n=68	Wardboys n=52	Nurses n=68
1	**Physiological hazards**								
A	**Biological hazards like cuts, wounds, and communicable diseases due to -**								
1	Exposure to blood born pathogens from percutaneous injuries, splashes and other contacts	-	-	-	-	-	4 (5.88)	-	-
2	Diseases such as syphilis, malaria, tuberculosis, as a result of a prick from syringe, needles etc.	-	-	-	-	-	8 (15.38)	-	4 (5.88) 2 years
3	Hazard of contracting a communicable disease	-	-	-	-	4 (7.69)	-	-	-

Cont....

S.no	Injuries/ health hazards	1 month		3 months		12 months		Life time	
		Wardboys n=52	Nurses n=68	Wardboys n=52	Nurses n=68	Wardboys n=52	Nurses n=68	Wardboys n=52	
B	**Chemical hazards** **Irritation to the skin, respiratory track and any type of allergy due to exposure to: -**								
1	Anesthetic agents: 1. Skin 2. Respiratory tract 3. Any other type of allergy	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- 4(5.88) -
2	Disinfectants / sterilizing agents 1 Skin 2 Respiratory tract 3 Any other type of allergy	- - -	- - -	- - -	- - -	- - -	- - -	- - -	8 (11.76) - -
3	Cleaning agents 1. Skin 2. Respiratory tract 3. Any other type of allergy	- - -	- - -	- - -	- - -	- - -	- - -	- - -	4 (5.88) - -

Cont....

S.no	Injuries/ health hazards	1 month		3 months		12 months		Life time	
		Wardboys n=52	Nurses n=68	Wardboys n=52	Nurses n=68	Wardboys n=52	Nurses n=68	Wardboys n=52	
C	**Physical Hazards due to exposure to**								
1	Smoke plume	-	-	-	-	-	-	-	4 (5.88)
D	**Accidental Hazards due to**								
1	Slips, trips and falls on wet floor especially during emergency situations	4 (7.69) (3-4 times)	-	-	8 (11.76) (1-3 times)	-	8 (11.76) (1-3 times)	-	-
2	Stabs and cuts from sharp objects 1. Needle sticks 2. Cuts by blades	4 (7.69) -	8 (11.76) -	4 (7.69) -	24 (35.29) 12 (17.64)	8 (15.38) -	16(23.52) -	- -	8 (11.76) 4 (5.88)
3	Burns and scalds from contact with 1. Hot sterilizing equipment or hot water 2. Steam pipes	- -	- -	- -	- -	- -	- -	- -	4 (5.88)

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S.no	Injuries/ health hazards	1 month		3 months		12 months		Life time	
		Wardboys n=52	Nurses n=68	Wardboys n=52	Nurses n=68	Wardboys n=52	Nurses n=68	Wardboys n=52	Nurses n=68
4	Electrical shock from faulty or improperly grounded equipment or equipment with faulty insulation	-	-	-	-	-	-	4 (7.69)	-
5	Acute back pain from awkward body position or over exertion when handling heavy patients	4 (7.69)	12 (17.64)	-	-	-	-	-	-
E	Violence problem								
1	Tolerance of abuse from physicians	8 (15.38)	16 (23.52)	-	-	-	-	-	-
2	Absence of respect from peers and other health care professionals	4 (7.69)	8 (11.76)	-	-	-	-	-	-
3	Absence of a code of conduct from all team	4 (7.69)	-	-	-	-	-	-	-

Cont....

S.no	Injuries/ health hazards	1 month		3 months		12 months		Life time	
		Wardboys n=52	Nurses n=68	Wardboys n=52	Nurses n=68	Wardboys n=52	Nurses n=68	Wardboys n=52	Nurses n=68
	Injuries								
1	Sprains and strains								
A	Elbow and forearm	-	-	-	-	-	-	-	4 (5.88)
B	Ankle and foot	-	-	-	-	-	-	8 (15.38)	8 (11.76)
C	Sacral	-	-	-	-	-	-	-	4 (5.88)
D	Back injuries	-	-	-	4 (5.88)	-	-	-	-
2	Fractures								
A	Elbow and Forearm	-	-	-	-	-	4(5.88)	-	-
B	Wrist and Hand	-	-	-	-	-	4(5.88)	-	-
C	Sacral	-	-	-	-	-	8 (11.76)	-	-
3	Dislocations								
A	Elbow and Forearm	-	-	-	-	-	2 (2.44)	-	-

* Figure in parenthesis represents percentage

contracted cold as a communicable disease from the patients. It was found that nurses were more prone to biological hazards as compared to wardboys due to the nature of work carried out by them and they do more patient handling tasks as compared to wardboys.

❖ Chemical Hazards

Health care workers are exposed to a large variety of chemical agents, which are being used in hospitals and other health facilities. Many sensitizers and allergens are in use in the health care industry. These agents include anaesthetic agents, disinfectants and laboratory reagents. Some of these substances cause irritation to the skin and respiratory tract and can cause allergy. Some others such as ethylene oxide, formaldehyde, hexachlorophene, are known as mutagens, tetratogens and human carcinogens (Collin, 1992). Acrylic and epoxy chemical are used in orthopedics and dentistry laboratory chemicals such as formaldehyde, chromium, cobalt an organic solvents can cause irritant dermatitis. The result of the study showed that 5.88 percent nurses developed irritation in respiratory tract due to anaesthetic agents, 11.76 percent nurses suffered form skin irritation due to disinfectants/sterilizing agents, 5.88 percent developed allergy form cleaning agents in respiratory tract. None of the wardboys suffered form any type of allergy from chemical regents. The nurses developed these allergies for lifetime. The HCWs selected for present study did not developed any type of irritation to the skin, respiratory tract and any other type of allergy due to exposure to laboratory reagents.

❖ Physical Hazards

Physical Hazards to HCWs are unbiguitous in hospital and clinics. They include ionizing radiation, noise, heat and cold, vibration, electric and magnetic fields. (International occupational Hazards data shots Nurses, 2004). It was noted

that 5.88 percent nurses suffered from physical hazards due to exposure to compressed gases. None of the HCWs were exposed to physical hazards due to ionizing radiations, noise, lasers and, smoke plume and any other cause.

❖ **Accidental Hazards**

It was observed that 7.69 percent wardboys accidentally, 3-4 times slipped, tripped and fell on wet floors especially during emergency situations within last 3 months and another 11.76 percent slipped, tripped and fell 1-3 times within last 12 month.

Needle stick injuries in health care workers may be quite common thereby making the risks of contracting blood borne infectious diseases very high. The reported incidence of needle stick injuries over the 12 month period was 1.30 per person and of injuries from other sharp objects 1.21 per person. (Guo, 1999). Where as in the present study the incidence of needle stick injuries over last 12 month was 4.50 per person, over last months was 3.30 per person, over last 1 month was 8.70 per person and 6.50 per person per day. The incidence of needle stick was high in nurses as compared to ward boys. The incidence of stabs and cuts form sharp objects over last 12 month was 2.0 per person. It was found that 17.64 percent nurses suffered from acute back pain from awkward body positions or over exertion while handling heavy patients over last 1 month. In nurses 5.88 percent burns and scalds from contact with hot sterilizing equipment or hot water, another 5.88 percent nurses suffered from injuries to legs and toes cause by falling objects e.g. medical instruments over last one and half years. In ward boys 7.69 percent suffered from electrical shock from faulty or improperly grounded equipment or equipment with faulty insulation.

❖ **Violence**

HCWs are at special risk of work place violence. Work related violence, defined as violent acts, including physical assaults and threats of assault directed towards persons at work or on duty (NIOSH, 1996) has been regained as a major problem. Violence against nurses has been identified as a major occupational problem (Arnety, 1998; Baxter, 1992; Carter, 2000). We also got the similar result 23.52 percent nurses face tolerance of verbal abuse from physicians, 11.76 percent tolerated absence of respect from peers and other health care professionals whereas among wardboys, 15.38 percent tolerated abuse form physicians, 7.69 percent tolerated absence of respect from peers and other health care professionals and another 7.69 percent tolerated absence of code of conduct from all team.

Work Related Injuries

The injuries and illnesses are more commonly reported on hospital workers as compared with those of all civilian workers. These injuries include strains and sprains, mental disorders, ill-defined, conditions, complications peculiar to medical care, fractures, dislocations (Health care workers guidelines, 2003). The results of the study showed that over the period of last 12 months, 11.76 percent nurses and 15.38 percent wardboys suffered from sprains and strains in ankle and foot. About 5.88 percent nurses suffered from ankle and foot sprains and strains from past 10-15 years, another 5.88 percent suffered from elbow and forearm sprain and strain, 5.88 percent got sprain and strain in back within last 3 month while working in hospital. It was found that 11.76 percent nurses fractured sacral over the period of last 12 months while working in hospital, 5.88 percent nurses fractured elbow and forearm and another 5.88 percent nurses fractured wrist and hand while working in hospital. Among nurses 5.88 percent dislocated elbow and

forearm while doing hospital job. None of wardboys got fractured and dislocation in any part of the body. None of the HCWs suffered from superficial injuries, contusions, toxic effects of substances etc.

It was concluded that HCWs suffered from biological hazards due to exposure to blood borne pathogens from percutaneous injuries, splashes and other contacts, they suffer from diseases such as, malaria and tuberculosis; chemical hazards such as irritation to the skin and respiratory tract due to anesthetic agents, disinfectants/ sterilizing agents and cleaning agents; physical hazards due to exposure to smoke plume; accidental hazards due to slips, trips and falls on wet floor especially during emergency situations, needle stick injuries and cuts by blades, hot sterilizing equipments and electric shock from equipments with faulty insulation; violence problem due to verbal abuse from physicians, absence of code of conduct from peers and other health care professionals. They also suffer from sprains and strains, fractures and dislocations in elbow/ forearm, ankle and foot, sacral while working in hospital.

The reason for these health hazards and injuries may be the unhygienic conditions of the hospitals because the risks of contracting an infection from patient were high where the hygienic conditions in hospitals are not proper. This was also reported by Ira (2001) and Niu (2001) in their study. Other reason may be that the HCWs were not following proper methods of recapping needles and proper disposal procedure of needles and sharps, lack of regular training programs for using the equipments and safety of HCWs or the job performance by a worker who is unfit and unaccustomed to the tasks.

Section V

Musculoskeletal symptoms experienced by HCWs

Musculoskeletal disorders and symptoms in a working population are common, occurring predominately in the lower back (Troup and Edwards, 1985), neck and upper limb (Armstrong *et.al*, 1982;Oxenbeerg *et.al* ,1985).

For recording and analysis of musculoskeletal symptoms standardized Nordic questionnaire was used. There are two types of questionnaires: a general questionnaire, and specific ones focusing on the low back and neck/shoulders. The purpose of the general questionnaire is simple surveying, while the specific ones permit somewhat more profound analysis. For the present study only a general questionnaire was used.

Musculoskeletal symptoms (Table 4.5.1)

The analysis showed that musculoskeletal symptoms occur more in nurses as compared to wardboys. It was found that 52.94 percent of nurses and Wardboys (30.76 percent) reported ache, pain, discomfort, numbness in lower back from past 7 days, 23.33 percent nurses and 11.76 percent Wardboys experienced pain in one or both hips/thigh, 11.76 percent nurses experienced in neck, 7.69 percent Wardboys experienced in right shoulder and 5.88 percent Wardboys experienced in one or both knees. Where as 70.58 percent nurses and 30.76 percent Wardboys experienced ache, pain, discomfort, numbness in lower back from past 6 months, 17.64 percent nurses and 30.76 percent Wardboys experienced this problem in one or both hips/thighs, 29.41 percent nurses and 7.69 Wardboys experienced in neck, 7.69 percent Wardboys experienced in right shoulder, 17.69 percent nurses experienced in upper back and 11.76 percent experienced in one or both knees.

Table 4.5.1 Analysis of musculoskeletal symptoms

s.no	Body parts	Musculoskeletal symptoms between 6-12 months			Musculoskeletal symptoms during last 6 months			Musculoskeletal symptoms during last 7 days			Prevented from carrying out normal activities because of this trouble		
		Nurses n=68	Wardboys n= 52	Total HCWs N=120	Nurses n=68	Wardboys n= 52	Total HCWs N=120	Nurses n=68	Wardboys n= 52	Total HCWs N=120	Nurses n=68	Wardboys n= 52	Total HCWs N=120
1	Neck	20 (29.41)	4 (7.69)	24 (20.0)	20 (29.41)	4 (7.69)	24 (20.0)	8 (11.76)	-	8 (6.66)	8 (11.76)	-	8 (6.66)
2	Shoulder												
	Right	-	4 (7.69)	4 (3.33)	-	4 (7.69)	4 (3.33)	-	4 (7.69)	4 (3.33)	-	4 (7.69)	4 (3.33)
	Left	-	-	-	-	-	-	-	-	-	-	-	-
	Both	4 (5.88)	-	4 (3.33)	-	-	-	-	-	-	-	-	-
3	Elbows												
	Right	-	-	-	-	-	-	-	-	-	-	-	-
	Left	-	-	-	-	-	-	-	-	-	-	-	-
	Both	4 (5.88)	-	4 (3.33)	-	-	-	-	-	-	-	-	-
4	Wrists/hands												
	Right		4 (7.69)	4 (3.33)	-	-	-	-	-	-	-	-	-
	Left	-	-	-	-	-	-	-	-	-	-	-	-
	Both	-	-	-	-	-	-	-	-	-	-	-	-
5	Upper back	12 (17.64)	-	12 (10.0)	12 (17.64)	-	12 (10.0)	-	-	-	-	-	-

Cont....

s.no	Body parts	Musculoskeletal symptoms between 6-12 months			Musculoskeletal symptoms during last 6 months			Musculoskeletal symptoms during last 7 days			Prevented from carrying out normal activities because of this trouble		
		Nurses n=68	Wardboys n= 52	Total HCWs N=120	Nurses n=68	Wardboys n= 52	Total HCWs N=120	Nurses n=68	Wardboys n= 52	Total HCWs N=120	Nurses n=68	Wardboys n= 52	Total HCWs N=120
6	Lower back	44 (64.70)	16 (30.76)	60 (50.0)	48 (70.58)	16 (30.76)	64 (53.33)	36 (52.94)	16 (30.76)	52 (43.33)	32 (47.05)	12 (23.07)	44 (36.66)
7	One or both hips/thighs	16 (23.52)	4 (7.69)	20 (16.66)	12 (17.64)	16 (30.76)	28 (23.33)	8 (11.76)	4 (7.69)	12 (10.0)	4 (5.88)	4 (7.69)	8 (6.66)
8	One or both knees	8 (11.76)	-	8 (6.66)	8 (11.76)	-	8 (6.66)	4 (5.88)	-	4 (3.33)	4 (5.88)	-	4 (3.33)
9	One or both ankle	8 (11.76)	-	8 (6.66)	-	-	-	-	-	-	-	-	-

* Figure in parenthesis represents percentage

On the other hand from past 6-12 months 64.70 percent nurses and 30.76 percent Wardboys experienced pain, ache, discomfort, numbness in lower back, 29.41 percent nurses and 7.69 percent Wardboys experienced in neck, 23.52 percent nurses and 7.69 percent Wardboys reported in one or both hips/ thighs, 17.64 percent nurses experienced in upper back, 11.76 percent nurses experienced in one or both knees, another 11.76 percent reported in one or both ankle, 5.88 percent experienced in both shoulders, another 5.88 percent experienced in both elbows where as 7.69 percent Wardboys experienced in right shoulder and another 7.69 percent reported in right wrist/ hands.

Musculoskeletal symptoms experienced by HCWs while performing different patient handling tasks and Non patient handling tasks

HCWs face a wide variety of work place hazards when conducting daily activities, the most significant being sharp injuries (Smith and Hitching, 2001)

Musculoskeletal disorders (MSD) are widely believed to be one of the most. frequently occurring and costly occupational maladies among health care workers. (Queensland Department of Health, 2000)

The aetiology of MSD among nursing staff is usually multi factorial, relating to work tasks, work postures, work control, and work organization. Several high-risk activities have been identified for nurses in the work place.

Borgs Perceived Exertion Scale (PES) for intensity of pain experienced by HCWs was adopted. Data was collected with the help of body map. On the basis of the scale the level of discomfort by HCWs were asked to respond on three point continum i.e. severe discomfort , moderate discomfort and mild discomfort.

Table 4.5.2 present the musculoskeletal symptoms and level of discomfort experienced by HCWs while performing different patient handling tasks and non-patient handling tasks.

A. Patient handling tasks

It was found that the high risk activities in which the nurses and wardboys experienced musculoskeletal symptoms in most of the body parts i.e. neck, shoulder, elbow/forearm, wrist/hand, upper back, hips/thighs, knees, lower back, ankle and foot was rolling patient from side to side, dressing/washing on bed, lifting a patient from lying to sitting on a bed, making bed with patient in it, and repositioning a patient in the bed. The activities are:

1. **Moving patient in chair/ hoist:** It was noted that while doing this activity 10.28 percent nurses reported musculoskeletal symptoms in upper back, 8.82 percent experienced in lower back, 5.88 percent in shoulder and 1.47 percent in neck. The discomfort level varies from mild to moderate. Where as among Wardboys 7.69 percent experienced musculoskeletal symptoms in shoulder, 9.61 percent in upper back and another 5.76 percent in lower back. The discomfort level in these body part were found to be mild.

2. **Washing in bath:** About eight percent nurses experienced musculoskeletal symptoms in lower back and 4.41 percent in neck. The level of discomfort was mild in neck and severe in lower back. Among Wardboys 5.76 percent experienced musculoskeletal symptoms in lower back, 3.84 percent in upper back and 1.92 percent in neck and, shoulder. The discomfort level was mild in neck, shoulder, and lower back and moderate in upper back.

3. **Repositioning a patient:** It was found that 23.52 percent nurses reported musculoskeletal symptoms in lower back, 11.76 percent in upper back, shoulder and neck. The level of discomfort experienced by nurses was moderate in these body parts. On the other hand 11.53 percent Wardboys

experienced musculoskeletal symptoms in upper back, 7.69 percent in lower back, 5.76 percent in shoulder and 3.84 percent in neck. Wardboys experienced mild discomfort in neck, upper back and lower back and moderate discomfort in shoulder.

4. **Rolling a patient from side to side:** The results of the study showed that 35.29 percent nurses faced musculoskeletal symptoms in lower back, 23.52 percent in upper back and neck, 16.17 percent in shoulder. The discomfort level in these body parts was found to be severe in neck, shoulder and lower back and moderate in upper back. About sixteen percent Wardboys experienced musculoskeletal symptoms in lower back, upper back and neck, 7.69 percent in shoulder. Wardboys experienced severe discomfort in lower back and upper back; moderate discomfort in neck and mild discomfort in shoulder while performing this activity.

5. **Transfer with one member of staff without lifting equipment:** It was observed that only 1.47 percent nurses reported musculoskeletal symptoms in lower back and neck with mild discomfort in these areas while performing this activity. Where as among Wardboys 15.38 percent suffered from musculoskeletal symptoms in lower back, 7.69 percent in neck and 5.76 percent in neck and wrist/hand and moderate in lower back.

6. **Transfer with two members of staff without lifting equipment:** While performing this activity 7.35 percent nurses experienced musculoskeletal symptoms in lower back and upper back, 4.41 percent experienced in knees and 1.47 percent in neck, shoulder, elbow/ forearm. The discomfort level was found to be mild in neck, elbow/ forearm, upper back, knees and lower back and moderate in shoulder. On the other hand in Wardboys 15.38 percent of them reported musculoskeletal symptoms in lower back and

Table 4.5.2 Musculoskeletal symptoms experienced by HCWs while performing various activities in hospital

1. Nurses

S.no	Activities	Neck	Shoulder	Elbow/ forearm	Wrist/ hand	Upper back	Hips/ thigh	Knees	Lower back	Ankle	Foot
A	**Patient handling tasks**										
1	Moving patient in chair/ hoist	1(1.47)	4 (5.88)-	-	-	7 (10.29)	-	-	6 (8.82)	-	-
	Discomfort level	1	1			2			1		
2	Washing in bath	3 (4.41)	-	-	-	-	-	-	5 (7.35)	-	-
	Discomfort level	1							3		
3	Repositioning a patient	8 (11.76)	8 (11.76)	-	-	8 (11.76)	-	-	16 (23.52)	-	-
	Discomfort level	2	2			2			2		
4	Rolling a patient from side to side	16 (23.52)	11 (16.17)	-	-	16 (23.52)	-	-	24 (35.29)	-	
	Discomfort level	3	3			2			3		

1- Mild discomfort, 2- Moderate discomfort, 3- Severe discomfort

Cont...

S.no	Activities	Neck	Shoulder	Elbow/ forearm	Wrist/ hand	Upper back	Hips/ thigh	Knees	Lower back	Ankle	Foot
5	Transfer with one member of staff without lifting equipment	1 (1.47)	-	-	-	-	-	-	1 (1.47)	-	-
	Discomfort level	1	2	2		2			1		
6	Transfer with two member of staff without lifting equipment	1 (1.47)	1 (1.47)	1 (1.47)	-	5 (7.35)	-	3 (4.41)	5 (7.35)	-	
	Discomfort level	1	2	1		1		1	1		
7	Dressing/ washing on hoist	1 (1.47)	2 (2.94)	-	-	2 (2.94)	-	-	2 (2.94)	-	
	Discomfort level	1	2			1			1		
8	Dressing/ washing on commode	-	1 (1.47)	-	-	1 (1.47)	-	-	1 (1.47)	-	
	Discomfort level		1			2			1		
9	Dressing/ washing on bed	18 (26.47)	15 (22.05)	2 (2.94)	3 (4.41)	18 (26.47)	4 (5.88)	8 (11.76)	16 (23.52)	8 (11.76)	4 (5.88)
	Discomfort level	3	3	2	1	2	3	2	1	1	

Cont....

S.no	Activities	Neck	Shoulder	Elbow/ forearm	Wrist/ hand	Upper back	Hips/ thigh	Knees	Lower back	Ankle	Foot
10	Lifting a patient from lying to sitting on bed	32 (47.05)	18 (26.47)	8 (11.76)	7 (10.29)	20 (29.41)	4 (5.88)	7 (10.29)	28 (41.17)	5 (7.35)	4 (5.88)
	Discomfort level	3	3	1	1	3	3	2	3	1	1
11	Making bed with patient in it	20 (29.41)	8 (11.76)	8 (11.76)	11 (16.17)	27 (39.70)	4 (5.88)	4 (5.88)	28 (41.67)	4 (5.88)	4 (5.88)
	Discomfort level	3	3	3	1	3	3	3	2	1	1
12	Assisting the patient at using toilet	1 (1.47)	5 (7.35)	-	-	-	-	-	1 (1.47)	-	-
	Discomfort level	1	1						1		
13	Assisting with eating/ drinking	-	-	-	-	-	-	-	-	-	-
	Discomfort level	-	-	-	-	-	-	-	-	-	-
14	Medical wound care	1 (1.47)	2 (2.94)	-	-	2 (2.94)	-	-	2 (2.94)	-	-
	Discomfort level	1	1			1			1		

Cont.....

S.no	Activities	Neck	Shoulder	Elbow/ forearm	Wrist/ hand	Upper back	Hips/ thigh	Knees	Lower back	Ankle	Foot
15	Adjusting bed for patient during feeding etc	4 (5.88)	-	-	-	-	-	-	4 (5.88)	-	-
	Discomfort level	1							1		
16	Patient care	3 (4.41)	-	1 (1.47)	-	2 (2.94)	-	-	1 (1.47)	-	-
	Discomfort level	1		1		1			1		
B	**Non patient handling tasks**										
1	Preparation of work surface/ organization of meals	-	-	-	-	-	-	-	-	-	-
	Discomfort level										
2	Collecting equipments	-	-	-	-	-	-	-	-	-	-
	Discomfort level	-	-	-	-	-	-	-	-	-	-
3	Moving furniture	12 (17.64)	12 (17.64)	-	-	12 (17.64)	-	12 (17.64)	12 (17.64)	-	-
	Discomfort level	2	3			3		3	3		
4	Bed making	20 (29.41)	16 (23.52)			4 (5.88)			20 (29.41)		
	Discomfort level	3	3			3			3		

Cont....

S.no	Activities	Neck	Shoulder	Elbow/ forearm	Wrist/ hand	Upper back	Hips/ thigh	Knees	Lower back	Ankle	Foot
5	Pulling equipments	20 (29.41)	18 (26.47)	-	-	8 (11.76)	-	-	24 (35.29)	-	-
	Discomfort level	1	1			2			1		
6	Writing patients notes	7 (10.29)	11 (16.17)	-	-	12 (17.69)	-	-	4 (5.88)	-	-
	Discomfort level	1	3			2			2		
7	Other administrative tasks	8 (11.76)	8 (11.76)	-	-	8 (11.76)	-	-	8 (11.76)	-	-
	Discomfort level	3	2			3			3		

2. Wardboys

S.no	Activities	Neck	Shoulder	Elbow/ forearm	Wrist/ hand	Upper back	Hips/ thigh	Knees	Lower back	Ankle	Foot
A	**Patient handling tasks**										
1	Moving patient in chair/ hoist	5 (9.61)	4 (7.69)	-	-	3 (5.76)	-	-	3 (5.76)	-	-
	Discomfort level	1	1			1			1		
2	Washing in bath	1 (1.92)	1 (1.92)	-	-	2 (3.84)	-	-	3 (5.76)	-	--
	Discomfort level	1	1			2			1		

Cont.....

S.no	Activities	Neck	Shoulder	Elbow/ forearm	Wrist/ hand	Upper back	Hips/ thigh	Knees	Lower back	Ankle	Foot
3	Repositioning a patient	2 (3.84)	3 (5.76)	-	-	6 (11.53)	-	-	4 (7.69)	-	-
	Discomfort level	1	2			1			1		
4	Rolling a patient from side to side	8 (15.38)	4 (7.69)	-	-	8 (15.38)	-	-	8 (15.38)	-	-
	Discomfort level	2	1			3			3		
5	Transfer with one member of staff	4 (7.69)	-	-	3 (5.76)	--	-	-	8 (15.38)	-	-
	Discomfort level	1			1				2		
6	Transfer with 2 member of staff	1 (1.92)	1 (1.92)	-	-	8 (15.38)	-	-	8 (15.38)	-	-
	Discomfort level	1	1			3			3		
7	Dressing/ washing on hoist	-	-	-	-	-	-	-	-	-	-
	Discomfort level	-	-	-	-	-	-	-	-	-	-
8	Dressing/ washing on commode	-	-	-	-	-	-	-	-	-	-
	Discomfort level										

Cont.....

S.no	Activities	Neck	Shoulder	Elbow/ forearm	Wrist/ hand	Upper back	Hips/ thigh	Knees	Lower back	Ankle	Foot
9	Dressing/ washing on bed	12 (23.07)	11 (21.15)	8 (15.38)	-	10 (19.23)	1 (1.92)	-	8 (15.38)	3 (5.76)	-
	Discomfort level	2	3	2		3	2		3	3	
10	Lifting a patient from lying to sitting on bed	12 (23.07)	12 (23.07)	2 (3.84)	-	18 (34.61)	1 (1.92)	-	18 (34.61)	3 (5.76)	-
	Discomfort level	3	3	2		3	1		3	1	
11	Making bed with patient in it	10 (19.23)	18 (34.61)	-	8 (15.38)	17 (32.69)	-	5 (9.61)	15 (28.84)	8 (15.38)	-
	Discomfort level	3	2		2	3		3	3	1	
12	Assisting the patient at using toilet	4 (7.69)	2 (3.84)	4 (7.69)	4 (7.69)	3 (5.76)	-	4 (7.69)	2 (3.84)	-	-
	Discomfort level	3	3	2	2	3		3	3		
13	Assisting with eating/ drinking	-	-	-	-	-	-	-	-	-	-
	Discomfort level	-	-	-	-	-	-	-	-	-	-
14	Medical wound care	2 (3.84)	2 (3.84)	-	2 (3.84)	2 (3.84)	-	-	2 (3.84)	-	-
	Discomfort level	1	1		2	3			3		

Cont....

S.no	Activities	Neck	Shoulder	Elbow/ forearm	Wrist/ hand	Upper back	Hips/ thigh	Knees	Lower back	Ankle	Foot
15	Adjusting bed for patient during feeding etc	5 (9.61)	7 (13.46)	-	-	-	-	-	6 (11.53)	-	-
	Discomfort level	3	2						3		
16	Patient care	2 (3.84)	3 (5.76)	-	2 (3.84)	1 (1.92)	-	-	3 (5.76)	-	-
	Discomfort level	1	2		1	1			3		
	Non patient handling tasks										
1	Preparation of work surface/ organization of meals	-	-	-	-	-	-	-	-	-	-
	Discomfort level										
2	Collecting equipments	--	-	-	-	-	-	-	-	-	-
3	Moving furniture	12 (23.07)	4 (7.69)	-	1 (1.92)	4 (7.69)	-	-	8 (15.38)	-	-
	Discomfort level	2	2		1	3			3		
4	Bed making	6 (11.53)	6(11.53)	-	-	-	-	-	8 (15.38)	-	-
	Discomfort level	3	2						3		

Cont.....

S.no	Activities	Neck	Shoulder	Elbow/ forearm	Wrist/ hand	Upper back	Hips/ thigh	Knees	Lower back	Ankle	Foot
5	Working equipments	4 (7.69)	4 (7.69)	-	-	-	-	-	4 (7.69)	-	-
	Discomfort level	2	2						2		
6	Pulling equipments	2 (3.84)	7 (13.46)	8 (15.38)	4 (7.69)	10 (19.23)	-	9 (17.30)	10 (19.23)	-	-
	Discomfort level	2	2	1	2	2		3	3		
7	Writing patients notes	2 (3.84)	3 (5.76)	-	-	3 (5.76)	-	-	4 (7.69)	-	-
	Discomfort level	2	2			1			2		

upper back, 1.92 percent in neck and shoulder. The discomfort level was severe in upper back and lower back and mild in neck and shoulder.

7. **Dressing / washing on hoist:** It was observed that 2.94 percent nurses experienced musculoskeletal symptoms in lower back, upper back and shoulder, 1.47 percent in neck while performing this activity. The level of discomfort was mild in neck, upper back and lower back and moderate in shoulder. Among Wardboys none of them reported any type of musculoskeletal symptoms any body parts while doing this activity.

8. **Dressing/ washing on commode:** Few i.e. 1.47 percent nurses reported musculoskeletal symptoms in shoulder, upper back and lower back while performing this activity. It was found that the level of discomfort was mild in shoulder and lower back; moderate in upper back. None of the Wardboys reported any type of musculoskeletal symptoms any body parts while doing this activity.

9. **Dressing/ washing on bed:** It was found that when nurses performed this activity 26.47 percent experienced musculoskeletal symptoms in upper back, another 26.47 percent experienced in neck, 23.52 percent experienced in lower back, 22.05 percent in shoulder, 11.76 percent in knees, another 11.76 percent in ankle, 5.88 percent in foot , another 5.88 percent in hips/thighs, 4.41 percent in wrist/ hand and 2.94 percent in elbow/ forearm. The discomfort level was found to be mild in wrist/ hand, lower back and ankle; moderate in elbow/forearm, upper back and knees and severe in neck, shoulder and hips/thighs. Where as when Wardboys performed this activity 23.07 percent of them reported musculoskeletal symptoms in neck, 21.15 percent in shoulder, 19.23 percent in upper back, 15.38 percent in

elbow/ forearm, 5.76 percent in ankle and 1.92 percent in hips /thighs. The discomfort level was mild in hips/thighs and ankle; moderate in neck, shoulder, and elbow/ forearm and severe in upper back and lower back.

10. **Lifting a patient from lying to sitting on bed:** It was noted that 47.05 percent nurses reported musculoskeletal symptoms in neck, 41.17 percent in lower back, 29.41 percent in upper back, 26.47 percent in shoulder, 11.76 percent in elbow/ forearm, 10.29 percent in wrist/ hand, another 10.29 percent in knees, 7.35 percent in ankle and 5.88 percent in foot while performing this activity. The discomfort level was mild in elbow/ forearm, wrist/hand, ankle and foot; moderate in knees and severe in neck, shoulder, upper back, hips/ thighs and lower back. Among wardboys 34.61 percent experienced musculoskeletal symptoms in upper back, another 34.61 percent experienced in lower back, 23.07 percent in neck and shoulder, 5.76 percent in ankle, 3.84 percent in elbow/ forearm and 1.92 percent in hips/ thigh and ankle; moderate in elbow/ forearm and severe in neck, shoulder, upper back and lower back.

11. **Making a bed with patient in it:** When nurses make patients bed when patient was in the bed 41.67 percent nurses experienced musculoskeletal symptoms in lower back, 39.70 percent in upper back, 29.41 percent in neck, 16.77 percent in wrist/ hand, 11.76 percent in shoulder and another 11.76 percent in elbow/ forearm, 5.88 percent in knees, hips/ thighs, ankle and foot. The discomfort level was mild in wrist/ hand, ankle, and foot; moderate in lower back, hips/ thighs and knees. When wardboys performed this activity 32.69 percent experienced musculoskeletal symptoms in upper back, 34.61 percent in shoulder, 28.84 percent in lower back, 19.23 percent in neck, 15.38 percent in ankle, another 15.38 percent in wrist/ hand and 9.61 percent in knees. The level of discomfort is mild in ankle; moderate in

shoulder, and wrist/ hand and severe in neck, upper back, knees and lower back.

12. **Assisting the patient at using toilet:** Very few of nurses i.e. 7.35 percent experienced musculoskeletal symptoms in shoulder, 1.47 percent in neck and another 1.47 percent in lower back while performing this activity. The discomfort level was mild in shoulder, neck and lower back. Where as among wardboys 7.69 percent experienced musculoskeletal symptoms in neck, elbow/ forearm, knees, and wrist/ hand, 5.76 percent in upper back, 3.84 percent in lower back and another 3.84 percent in shoulder. The discomfort level was moderate in elbow/ forearm, wrist/ hand, and severe in neck, shoulders, upper back, knees and lower back.

13. **Assisting with eating/ drinking:** None of the HCWs experienced any type of musculoskeletal symptoms while doing this activity.

14. **Medical wound care:** It was found that 2.94 percent nurses experienced musculoskeletal symptoms in shoulder, upper back and lower back and 1.47 percent while taking care of medical wound. The discomfort level was mild in these body parts. When wardboys performed this activity 3.84 percent of them experienced musculoskeletal symptoms in neck, shoulder, wrist/ hand, upper back and lower back. The discomfort level was mild in these body parts.

15. **Adjusting bed for patient during feeding etc:** It was noted that when nurses performed this activity 5.88 percent nurses experienced musculoskeletal symptoms in lower back and neck with mild discomfort. Where as 13.46 percent wardboys reported musculoskeletal symptoms in shoulder, 11.53 percent in lower back and 9.61 percent in neck. The

discomfort level was moderate in shoulder, and severe in neck and lower back.

16. **Patient care:** Few of the nurses experienced musculoskeletal symptoms while performing this activity i.e. 4.41 percent in neck, 2.94 percent in upper back, 1.47 percent in elbow / forearm and 1.47 percent in lower back and the discomfort level was also mild in these body parts. On the other hand 5.76 percent wardboys experienced musculoskeletal symptoms in shoulder, 5.76 percent in lower back, 3.84 percent in wrist/ hand, 1.92 percent in upper back. The discomfort level was mild in neck, wrist/ hand and upper back; moderate in shoulder and severe in lower back.

Non-patient handling tasks

It was noted that while performing non-patient handling tasks the high risk activities in which majority of nurses and wardboys experienced musculoskeletal symptoms in neck, shoulder, elbow/forearm, upper back, knees and lower back was moving furniture, bed making, pulling equipment's, writing patients notes and other administrative tasks. The activities are:

I **Preparation of work surface/ organization of meals:** It was found that none of the HCWs reported any type of musculoskeletal symptoms while preparing work surface/ organization of meals and while collecting equipments.

2. Moving Furniture: It was noted that when nurses performed this activity 17.64 percent nurses reported musculoskeletal symptoms in neck, shoulder, upper back, knees and lower back. The discomfort level was found to be severe in these body parts. Where as when wardboys moved

furniture 23.07 percent of them experienced musculoskeletal symptoms in neck, 15.38 percent in lower back, 7.69 percent in shoulder and upper back and 1.92 percent in wrist/hand. The discomfort level was mild in wrist /hand; moderate in neck and shoulder and severe in upper back and lower back.

3. Bed making: It was observed that when nurses performed bed making activity 29.41 percent nurses experienced musculoskeletal symptoms in lower back and neck, 23.52 percent in shoulder and very few 5.88 percent in upper back. The discomfort level was severe in these body parts. On the other hand 15.38 percent wardboys reported low back musculoskeletal symptoms, 11.53 percent experienced in neck and shoulder. The discomfort level was moderate in shoulder and severe in neck and lower back.

4. Pulling equipments: The results of the study showed that when nurses performed this activity 35.29 percent nurses reported low back musculoskeletal symptoms, 29.41 percent experienced in neck, 26.47 percent in shoulder and 11.76 percent in upper back with mild level of discomfort in neck, shoulder and lower back and moderate level discomfort in upper back. Among wardboys 19.23 percent reported musculoskeletal symptoms in upper back and lower back,17.30 percent in knees, 15.38 percent in elbow/ forearm, 13.46 percent in shoulder, 7.69 percent in wrist/hand and 3.84 percent in neck. The discomfort level was mild in elbow/ forearm; moderate in neck shoulder, wrist/hand and upper back and severe in knees and lower back.

5. Writing up patient's notes: This activity was mostly performed by nurses. Out of the total nurses selected for the present study 17.69 percent reported musculoskeletal symptoms in upper back, 16.17 percent in

shoulder, 10.29 percent in neck and 5.88 percent in lower back. The discomfort level was found to be mild in neck; moderate in upper and lower back and severe in shoulder. Where as few i.e. 7.69 percent wardboys experienced musculoskeletal symptoms in lower back, 5.76 percent in upper back and shoulder and 3.84 percent in neck with mild discomfort in upper back, and moderate in neck, shoulder and lower back.

6. Other administrative tasks: It was found that 11.76 percent nurses reported musculoskeletal symptoms in neck, shoulder, upper back and lower back with moderate discomfort in shoulder and severe discomfort in neck, upper back and lower back. Where as among wardboys 7.69 percent experienced musculoskeletal symptoms in neck shoulder and lower back with moderate discomfort.

It was concluded from the results that majority of nurses and ward boys reported musculoskeletal symptoms in neck, shoulder, upper back and lower back while performing patient handling tasks such as lifting patient from lying to sitting on bed, dressing/washing of patient in bed, making bed with patient in it and non patient handling tasks such as bed making with out patient in it, moving furniture and pulling equipments.

The causes of these musculoskeletal symptoms could be rapid body movement combined with poor posture or awkward work posture such as prolonged standing, bending or kneeling, for any length of time while performing these patient handling tasks and non-patient handling tasks. Job performance by a worker who is unfit or unaccustomed to the tasks can also be one of the factors causing musculoskeletal symptoms. Similar causes of musculoskeletal symptoms experienced by HCWs while performing different activities in hospital was also found by Harber *et.al*, 1985; Kant *et.al*, 1992; Burton *et.al*, 1997; Ando *et.al*,

2000; Smith and Hitchings, 2001 in their studies on hospital workers performing hospital tasks while working in hospital.

Section VI

Anthropometric Measurement of Selected Health Care Workers

The anthropometric characteristics of any population are dependent upon the large number of biological, social and demographic variables (Pheasant, 1986). Knowledge of anthropometric dimensions is an important requisite for the designing of work space, work place and equipment. (Population of different places, region varies in their anthropometric characteristics). There should be a comfortable, safe and satisfactory match between the artifact and the user. Anthropometric measurements of selected HCWs were taken. The anthropometric variables were selected from lists published by the ISO and NASA (ISO 7250, draft international standard (1992) (ISO/DIS 7250.2 (1992) The anthropometric data were analyzed to yield mean, Standard deviation and 5^{th} and 95^{th} percentile of each anthropometric variable.

The 5^{th} and 95^{th} percentiles of the respondents are generally considered for any designing purpose. Hence the 5^{th} and 95^{th} percentile dimensions are reported for anthropometric measurement (Table 4.6.1).

Height

Analysis of the table 4.6.1 showed that mean height of nurses and wardboys was 154.5 ±3.35 cm and 175.7 1 ± 9.95 cm respectively. The 5^{th} and 95^{th} percentile for height of the nurses was 154.5 cm and 159.5 cm and for the ward boys were 176.50 cm and 188.50 cm respectively.

Eye Height

The mean eye height of nurses was measured as 145.9± 3.10 cm and of ward boys was measured as 156.08 ± 3.18 cm. The eye height in standing posture with 5^{th} and 95^{th} percentile for nurses and wardboys was 146.0 cm and 149.9 cm and 155.2 cm and 161.12 cm respectively.

Shoulder Height

It was observed that the mean shoulder height of nurses was 131.5 ±2.79 cm and of ward boys was 141.4 ± 3.61 cm. The 5^{th} and 95^{th} percentile for the shoulder height for nurses was 130 cm and 135.8 cm and that for wardboys was 141 cm and 146.75 cm.

Elbow Height

It was found that the mean elbow height of nurses was 103.45 ± 3.90 cm and of wardboys for ward boys was 110.66 ±4.14 cm. the 5^{th} percentile of the elbow height for nurses was 103.75 cm and for wardboys was 111.0cm, 95^{th} percentile for nurses was 107.8cm and for ward boys was 115.76cm.

Grip Inside diameter

It was noted that mean hand drip diameter of nurses was 3.5 ±0.07 cm and of ward boys was 4.0 ± 0.10cm. 5^{th} and 95^{th} percentile of nurses was 3.0cm and 4.0 cm and of wardboys were 3.50 cm and 4.20 cm.

Trunk Length

The mean trunk length of nurses was 95.23±2.74 cm and of wardboys was 109.25±12.74 cm. 5^{th} and 95^{th} percentile of nurses was found to 96.5cm and 98.05 cm and of ward boys was 103.0cm and 133.0 cm.

Popliteal Height

It was observed that mean popliteal height of nurses was 45.16 ± 1.34 cm and of wardboys was 50.26±2.87 cm; 44.5cm and 47.0 cm was 5^{th} and 95^{th} percentile of nurses and 50.30 cm and 54.25cm was of ward boys.

Knee Height

The mean knee height of nurses was found to be 47.91 ±0.73 cm and of wardboys was 52.16 ±2.54 cm with 5^{th} and 95^{th} percentile was found to be 48.0 cm and 48.8 cm for nurses 52.50 cm and 55.0 cm for ward boys.

Hand Length

The mean hand length of nurses and wardboys was 48.83±6.66 cm and 52.66 ±2.28cm respectively. 50.0 cm and 52.5cm was the 5^{th} and 95^{th} percentile of the nurses and 52.0 cm and 55.75cm of the wardboys.

Palm Length

It was found that the mean palm length of nurses was 8.83 ±0.62 cm and of wardboys was 9.91 ± 53 cm. The 5^{th} and 95^{th} percentile of the nurses and ward boys was 9.0cm and 9.5 cm and 9.75 cm and 10.75cm respectively.

Elbow to Elbow breadth

It was noted that the mean elbow to elbow breath of nurses and wardboys was 2.7.33±0.74 cm and of wardboys was 27.50 ± 1.50 cm. 27.5 cm and 28.0 cm was the 5^{th} and 95^{th} percentile of nurses; 28.0 cm and 29.0cm was the 5^{th} and 95^{th} percentile of wardboys.

Standing wrist length

It was observed that the mean standing wrist length of nurses and wardboys was 75.33±4.85 and 86.83 ± 2.85 cm. 77.0cm and 86.0cm was the 5th percentile of the nurses and the 95th percentile was 79.0cm and 94.0 cm for the standing wrist length.

Foot Length

The mean foot length of nurses was 22.5±1.19 cm and of wardboys was 24.25±2.30cm. The 5th and 95th percentile of nurses and ward boys was 20.8cm and 25.7cm and 22.0cm and 26.5 cm respectively.

Table 4.6.1. Anthropometric measurements of selected HCWs

S.no	Anthropometric measurements	HCWs	Min.	Max.	Mean	S.D	Percentile	
							5th	95th
1	Height (cm)	Nurses	151	161	154.5	3.35	154.5	159.5
		Wardboys	154	190	175.7	9.95	176.5	188.5
2	Eye height (cm)	Nurses	141.5	157	145.9	3.10	146	149.9
		Wardboys	152.5	162.5	156.0	3.18	155.2	161.1
3	Shoulder height (cm)	Nurses	128.5	136.5	131.5	2.79	130	135.8
		Wardboys	136.5	148	141.4	3.61	141	146.7
4	Elbow height (cm)	Nurses	98	107.5	103.4	3.90	103.7	107.8
		Wardboys	106	115	110.6	4.14	111.0	115.7
5	Grip Inside diameter (cm)	Nurses	2.50	4.0	3.5	0.07	3.0	4.00
		Wardboys	3.0	4.5	4.0	0.10	3.50	4.20
6	Trunk length	Nurses	92	100.5	95.2	2.74	96.5	98.0
	(cm)	Wardboys	96	142	109.2	12.74	103.0	133.0

S.no	Anthropometric measurements	HCWs	Min.	Max.	Mean	S.D	Percentile	
							5^{th}	95^{th}
7	Popliteal height (cm)	Nurses	44	47	45.1	1.34	44.5	47.0
		Wardboys	48	55.0	50.2	2.87	50.3	54.2
8	Knee height (cm)	Nurses	47.0	49.0	47.9	0.73	48.0	48.8
		Wardboys	48.0	55.0	52.16	2.54	52.5	55.0
9	Hand length (cm)	Nurses	33.0	53.0	48.8	6.66	50.0	52.5
		Wardboys	49.0	56.0	52.6	2.28	52.0	55.7
10	Palm length (cm)	Nurses	8.00	9.50	8.83	0.62	9.00	9.50
		Wardboys	9.50	11.0	9.91	0.53	9.75	10.7
11	Elbow to elbow breadth (cm)	Nurses	37.0	44.0	41.5	3.14	42.0	45.5
		Wardboys	41.5	47.0	43.2	2.26	42.0	47.0
12	Elbow to wrist length (cm)	Nurses	26.0	29.0	27.3	0.74	27.5	28.0
		Wardboys	25.0	29.0	27.5	1.50	28.0	29.0
13	Standing wrist length(cm)	Nurses	65.0	79.0	75.3	4.85	77.0	79.0
		Wardboys	81.0	90.0	86.83	2.85	86.0	94.0

Dimensions of the selected equipment/furniture of hospital

Table 4.6.2 showed the measurements of the selected equipment and furniture of hospital.

1. **Bed:** The dimensions of bed were taken with the help of measuring instruments. The bed length was 198 cm with width of 91cm and height of 61cm.

2. **Bed side lockers:** The bed side lockers had 162cm length, 81 cm height and 40 cm width.

Table 4.6.2 Dimensions of Hospital Equipments/Furniture

S.no	Hospital equipments/furniture	Length (cm)	Height (cm)	Width (cm)	Circumference (cm)
1	Bed	198.0	61.0	91.0	-
2	Bed side lockers	162.0	81.0	40.0	-
3	Stretcher (with stand)	210.0	82.0	56.0	15 (h)
4	Stretcher (with out stand)	210.0	15.0	56.0	15 (h)
5	Wheel chair	90.0	92.0	47.5	15 (h)
6	Table	180.0	120.0	90.0	-
7	Chair	60.0	45.0	45.0	-
8	Foot step	50.0	40.0	46.0	-
9	I.V set stand	150 (Max) 140 (Mid) 130 (min)	-	-	-
10	Operation table	141	66.0	52.0	
11	Drug trolley	60.0	120	80	15

H= handle of equipment

3. **Stretcher with stand**: The length of stretcher with stand was 210 cm and height and width was 82cm and 56cm respectively. The circumference of handle of stretcher was 15cm.
4. **Stretcher without stand:** The length of stretcher without stand was 210 cm, height 15cm and width 56cm. The circumference of handle of stretcher was 15cm.
5. **Wheel chair:** The wheel chair had length of 90cm, height was 92 cm with width of 47.5cm and circumference of handle 15 cm.
6. **Table:** The length of table was 180 cm, height 120cm and width 90 cm.
7. **Chair:** The chair length was 60 cm. height 45cm and width 45cm.
8. **Foot step:** The length of foot step was 50 cm. with height of 40cm and width of 46cm.
9. **I.V. set holding stand:** The I.V. Set Stand had adjustable height of 150cm/140cm/130cm with its circumference 15cm.
10. **Operation table:** The size of operation table was length 141cm, height 66 cm and width 52cm.
11. **Drug trolley**: The drug trolley length was 60cm, height 120cm and width 80cm.

Considering the anthropometric measurements and the existing dimensions of hospital equipments / furniture it can be said that the furniture and equipments were not of proper height. As the work surface height for the standing work should be slightly below the elbow height namely (5-10 cm below) (Grandjean, 1988) but in the present study for the nurses and ward boys the height of hospital furniture / equipments was too low.

Section VII

Psychological cost of work

Psychological cost of work is defined as the harmful physical and emotional responses of the workers when the requirements of the job do not match his/her capabilities, resources or needs. In the present study these include stress due to work, burnout and job satisfaction.

1. Burnout

Burnout is characterized as psychological strain resulting form occupational strains. These symptoms of strain include changes in behavior towards clients or others and changes both in quality and involvement. An attempt was made to find out the level of burnout among hospital health care workers by using Maslach Burn out Inventory (MBI) (1981).

Table 4.7.1 presents the level of burnout and sub factors of burnout among HCWs. It showed that more than 80 percent HCWs had high level of burnout and very few i.e. 1.66 percent had low level of burnout.

Among nurses 85.29 percent and among wardboys 76.92 percent had high level of burnout. In ward boys only 3.84 percent had low level of burnout whereas none of the nurses had low level of burnout. Nurses were more prone to burnout than wardboys because of their nature of work, working shifts, family responsibilities nursing experience and their inability to cope with stress. This was reported by Dio(1988); Kazuyo *et.al*, 1999).Nurses in present study also showed a similar tendency of burnout.

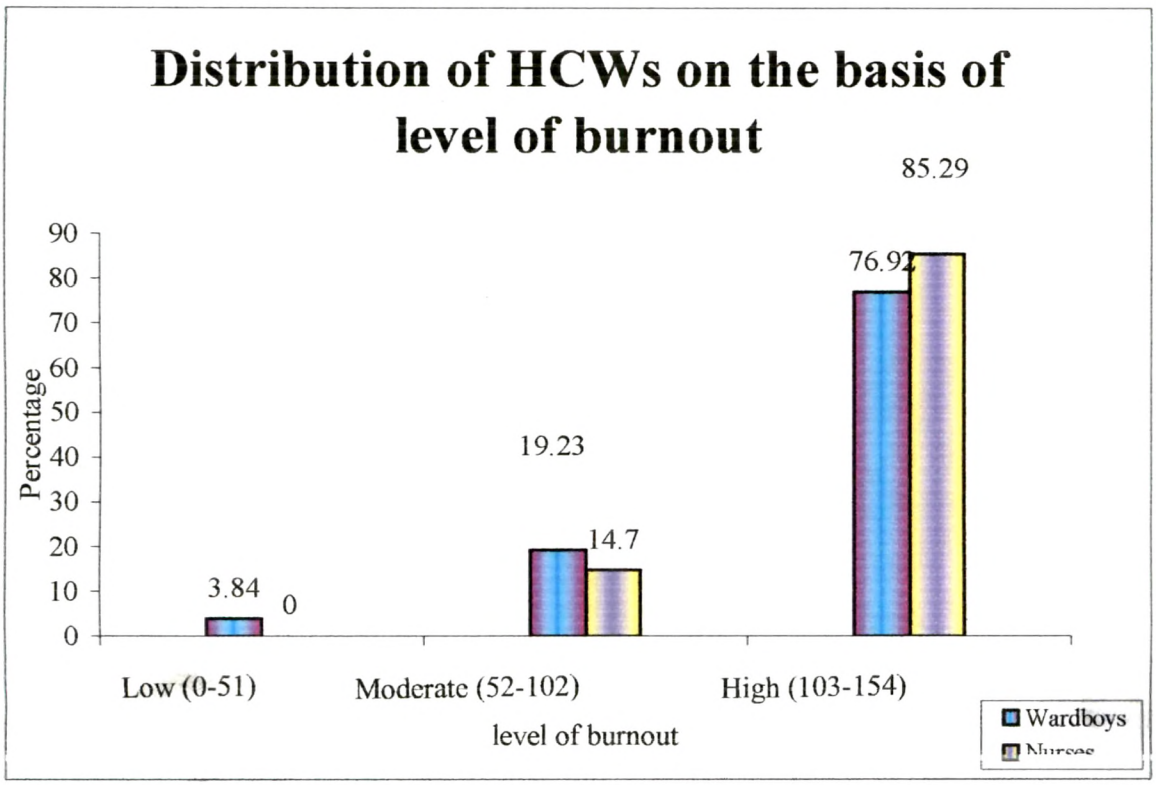


Fig 4.1 : Distribution of HCWs on the basis of level of burnout

Sub factors of burnout

A. Emotional Exhaustion and Depersonalization: (EE and DP)

Emotional Exhaustion/Depersonalization is actively identified as the "core of burnout" by walkey and Green (1992)

EE+DP sub scale measures feeling of being emotionally over extended by one's work, and having an impersonal and unfeeling attitude toward patients. As one's sense of depersonalization increase, one becomes negative, cynical and callous. In practice depersonalization is a problem that manifests itself as deterioration in the quality of work, with nurses treating patients as "object: (Maslach & Jackson 1981).

Table 4.7.1 Psychological cost of work of HCWs in terms of burnout, work stress and job satisfaction

S.no	Psychological cost of work	Health Care Workers		
		Wardboys n=52	**Nurses n=68**	**Total N=120**
1	**Level of burnout**			
	Low (0 -51)	2 (3.84)	-	2 (1.66)
	Moderate (52 -102)	10 (19.23)	10 (14.70)	20 (16.66)
	High (103 -154)	40 (76.92)	58 (85.29)	98 (81.66)
❖	**Sub factors of burnout**			
A	**Emotional exhaustion and depersonalization**			
	Low (0-23)	6 (11.53)	-	6 (5.00)
	Moderate (24 -47)	4 (7.69)	16 (23.52)	20 (16.66)
	High (48 - 70)	42 (80.76)	52 (76.47)	94 (78.33)
B	**Personal Accomplishment**			
	Low (0-18)	-	6 (8.88)	6 (5.00)
	Moderate (19 - 37)	18 (34.61)	14 (20.58)	32 (26.66)
	High (38-50)	34 (65.38)	48 (70.58)	82 (68.33)
C	**Physical Exhaustion**			
	Low (0-9)	4 (7.69)	8 (11.76)	12 (10.0)
	Moderate (10 –19)	6 (11.53)	2 (2.94)	8 (6.66)
	High (20-28)	42 (80.76)	58 (85.29)	100 (83.33)
2	**Level of work stress**			
	Low (0 -46)	-	-	-
	Moderate (47 - 92)	18 (34.61)	26 (38.23)	44 (36.66)
	High (93 - 138)	34 (65.38)	42 (61.76)	76 (63.33)

Cont...

S.no	Psychological cost of work	Health Care Workers		
		Wardboys n=52	Nurses n=68	Total N=120
❖	**Sub factors of work stress**			
A	**Stress due to time and scheduling pattern**			
	Low (0 -13)	4 (7.69)	10 (14.70)	14 (11.66)
	Moderate (14 - 26)	18 (34.61)	24 (35.29)	32 (26.66)
	High (27 - 39)	30 (57.69)	34 (50.0)	64 (53.33)
B	**Stress due to dealing with patients**			
	Low (0 –8)	16 (30.76)	-	16 (13.33)
	Moderate (9 – 16)	16 (30.76)	22 (32.35)	38 (31.66)
	High (17 - 24)	20 (38.46)	46 (67.64)	66 (55.0)
C	**Pay related stress**			
	Low (0-5)	18 (34.61)	12 (17.64)	30 (25.0)
	Moderate (6 - 10)	18 (34.61)	16 (23.52)	34 (28.33)
	High (11- 15)	16 (30.76)	40 (58.82)	56 (46.66)
D	**Stress due to interpersonal problems**			
	Low (0-7)	6 (11.53)	2 (2.94)	8 (6.66)
	Moderate (8 -14)	14 (26.92)	18 (26.47)	32 (26.66)
	High (15 - 21)	32 (61.53)	48 (70.58)	80 (66.66)
E	**Stress due to technical problem**			
	Low (0-6)	6 (11.53)	-	6 (5.00)
	Moderate (7 - 12)	8 (15.38)	22 (32.35)	30 (25.00)
	High (13-18)	38 (73.07)	46 (67.64)	84 (70.00)

Cont...

S.no	Psychological cost of work	Health Care Workers		
		Wardboys n=52	Nurses n=68	Total N=120
F	**Violence problem**			
	Low (0-7)	30 (57.69)	2 (2.94)	32 (26.66)
	Moderate (8 -14)	14 (26.92)	8 (11.74)	22 (18.33)
	High (15 - 21)	8 (15.38)	58 (85.29)	66 (55.00)
3	**Level of job satisfaction**			
	Low (0-55)	-	-	-
	Moderate (56 - 111)	42 (80.76)	54 (79.41)	96 (80.00)
	High (112- 165)	10 (19.23)	14 (20.58)	24 (20.00)
	❖ **Sub factors of Job satisfaction**			
A	**Work Autonomy**			
	Low (0-21)	-	-	-
	Moderate (22- 43)	16 (30.76)	28 (41.17)	44 (36.66)
	High (44-65)	36 (69.23)	40 (58.82)	76 (63.33)
B	**Work schedule**			
	Low (0-16)	-	-	-
	Moderate (17 - 33)	14 (26.92)	10 (14.70)	24 (20.00)
	High (34-50)	38 (73.00)	58 (85.29)	96 (80.00)
C	**Work environment**			
	Low (0-8)	-	1 (1.47)	1 (0.83)
	Moderate (9 -17)	28 (53.84)	18 (26.47)	46 (38.33)
	High (18-25)	24 (46.15)	49 (72.05)	73 (60.83)

Cont...

S.no	Psychological cost of work	Health Care Workers		
		Wardboys n=52	Nurses n=68	Total N=120
D	Occupational status			
	Low (0-8)	2 (3.84)	4 (5.88)	6 (5.00)
	Moderate (9 - 17)	26 (50.0)	16 (23.52)	42 (35.00)
	High (18 -25)	24 (46.15)	48 (70.58)	72 (60.00)

* Figure in parenthesis represents percentage

Similar results was also obtained in present study nurses (85.29 percent) highly emotionally exhausted and depersonalized as compared to wardboys while performing different activities in hospital and that manifests deterioration in the quality of their work. This may be because of their direct dealing with different types of patients; performing different activities, long working hours and long period of work.

B. Personal Accomplishment (PA)

Personal accomplishment measures feeling of competence and achievement in one's work with people. It was found that wardboys (65.38 percent) had more sense of personal accomplishment as compared to nurses (41.17).

C. Physical Exhaustion

This means feeling of being physically exhausted by one's work. It was noted that majority of (89.29 percent) nurses were highly physically exhausted by their hospital work as compared to wardboys (11.53 percent). As nurses have to perform dual responsibilities and when faced with the realities of a busy hospital they would feel stress and inability to cope with stress and feel physically exhausted; on the other hand, ward boys cope up with their stress more easily as compared to nurses and are more physically strong.

Work Stress

Health care worker appears to face stressors more than any other industry. The major stessors which have been documented include time related stress, dealing with patients, financial worries, staff problems, equipment break –down, defective materials, poor working conditions and the nature of the job (Cooper, 1980; Dunlop and Stewart, 1982; Furnham, 1983; Selor, 1984).

In the present study major stressors included stress due to time and scheduling pattern, stress due to dealing with patients, pay related stress, stress due interpersonal problems, and stress due to technical problems. The results contributed that the level of work stress were high in wardboys as compared to nurses.

It was found that 61.76 percent nurses and 65.38 percent of wardboys reported high level of stress while working in hospital.

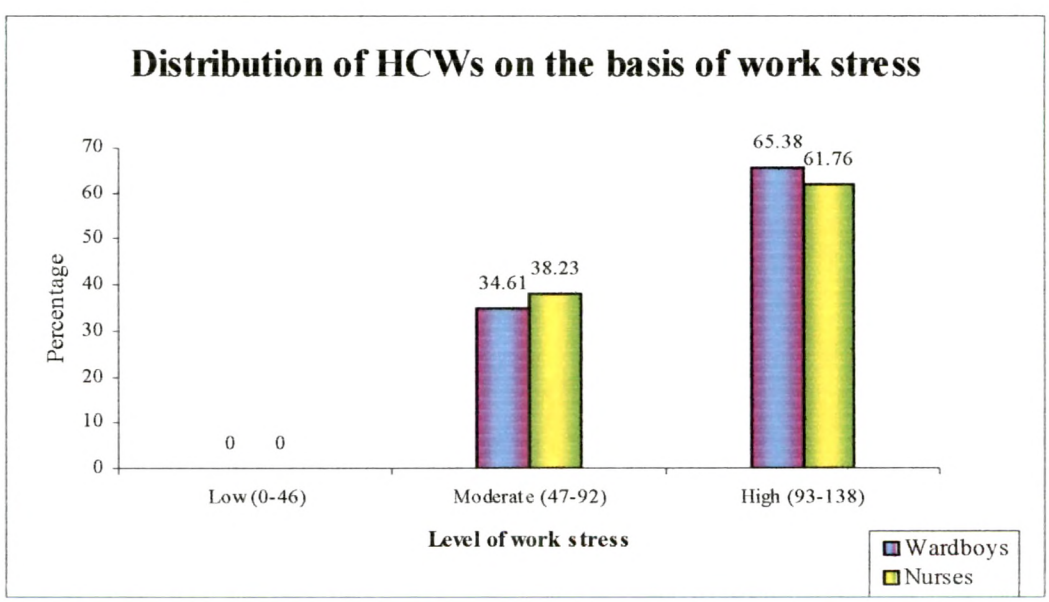


Fig 4.2: Distribution of HCWs on the basis of work stress

Sub factors of work stress

A. **Stress due to time and scheduling pattern:** It was noted that more than half i.e. 53.33 percent HCWs reported high level of stress due to time and scheduling pattern; 26.66 percent HCWs experienced moderate stress and 11.66 percent reported low level of stress.

B. **Stress due to dealing with patients:** It was found that majority of nurses (67.64 percent) were highly stressed due to direct dealing with patients than wardboys i.e. 38.46 percent. Fifty five percent HCWs experienced high level of stress due to dealing with patients, 31.66 percent reported moderate stress and 13.33 percent reported low level of stress.

C. **Pay related stress:** Pay related stress was also high among nurses (58.82 percent) in comparison to wardboys (30.76 percent). About 47 percent HCWs reported High level of pay related stress, 28.33 percent reported moderate level stress and 25.0 percent reported low level stress.

D. **Stress due to interpersonal problems:** It was found that 70.58 percent nurses and 61.53 percent wardboys experienced high level of stress due to interpersonal problems. About sixty seven percent HCWs reported High level of stress, 26.66 percent reported moderate level of stress and 6.66 percent reported low level of stress.

E. **Stress due to technical problems:** It was noted that stress due to technical problems was high among wardboys (73.07 percent) as compared to nurses (67.64percent). Seventy percent of HCWS reported high level of stress, 25 percent moderate level of stress and 5 percent experienced low level of stress.

F. **Stress due to violence problems:** The results of the study showed that 85.29 percent nurses reported high level of stress due to violence problems as compared to wardboys.

Job Satisfaction

Job satisfaction depicts the state of mind of an employee at a particular point of time i.e. whether he is satisfied or not with his job. The data depicted that majority of HCWs was moderately satisfied with their job and few of them were highly satisfied.

Among wardboys 19.23 percent and 20.58 percent nurses were highly satisfied with their job.

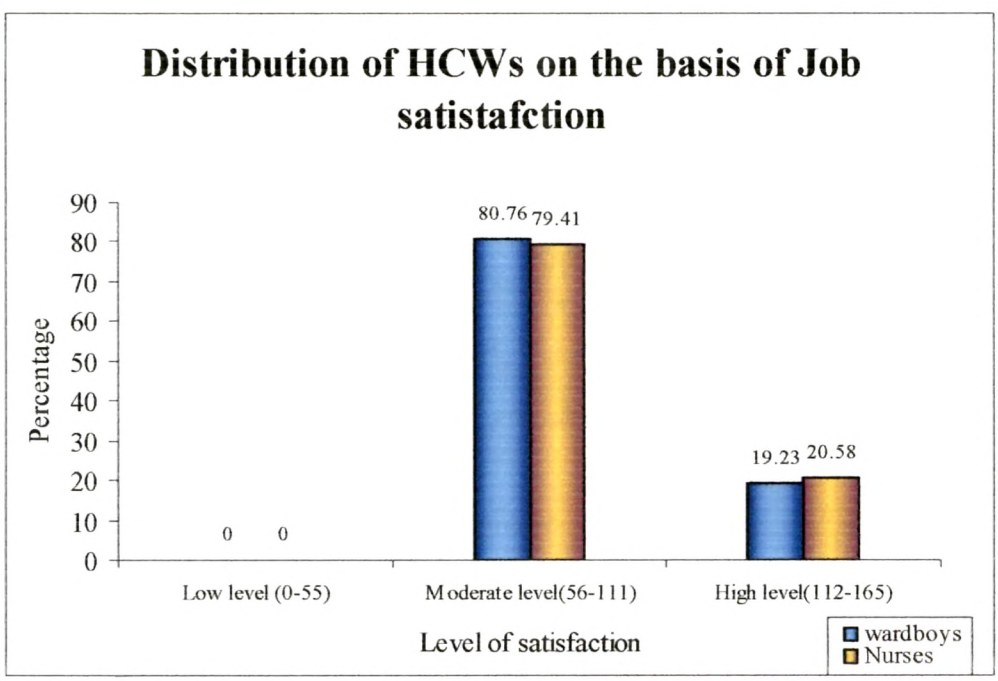


Fig 4.3 : Distribution of HCWs on the basis of job satisfaction

Sub factors of Job satisfaction:

1. **Work Autonomy:** It was observed that wardboys (69.23 percent) were more highly satisfied with work autonomy as compared to nurses (58.82 percent). About thirty one percent wardboys were moderately satisfied and 41.17 percent were less satisfied with work autonomy.

2. **Work schedule:** Eighty percent of HCWs were highly satisfied with work schedule and 20 percent were moderately satisfied.

3. **Work environment:** It was found that 60.83 percent HCWs were highly satisfied with work environment, 38.33 percent were moderately satisfied and 0.83 percent were less satisfied.

4. **Occupational Status:** Sixty percent of HCWs were highly satisfied with their occupational status, 35 percent were moderately satisfied and 5 percent were less satisfied.

It was concluded that nurses in present study showed a tendency of high level of burnout, the work induced stressors was also high in nurses. Majority of HCWs were highly satisfied with their job.

The results of the descriptive data showed that majority of HCWs performed both patient handling tasks and non patient handling tasks while working in hospital such as rolling patient from side to side for access when washing or changing on the bed, dressing/washing of patient of on bed, making bed with patient in it, assisting patient with eating/taking medicine and adjusting patients bed during feeding/sitting etc. under patient handling tasks and under non patient handling tasks were bed making, collecting equipments e.g. drug trolley, bowls for washing etc.

While working in the hospital HCWs were exposed to variety of health hazards such as biological hazards due to exposure to blood borne pathogens from percutaneous injuries, splashes and other contacts, they suffer from diseases such as, malaria and tuberculosis ;Chemical hazards such as irritation to the skin and respiratory tract due to anesthetic agents, disinfectants/ sterilizing agents and cleaning agents; Physical hazards due to exposure to smoke plume; accidental hazards due to slips, trips and falls on wet floor especially during emergency situations, needle stick injuries and cuts by blades, hot sterilizing equipments and electric shock from equipments with faulty insulation; violence problem due to verbal abuse from physicians, absence of code of conduct from peers and other health care professionals. Nurses were more prone to these hazards as compared to wardboys Health care workers also reported musculoskeletal symptoms in neck, shoulder, upper back and lower back while performing patient handling tasks such as lifting patient from lying to sitting on bed, dressing/washing of patient in bed, making bed with patient in it and non patient handling tasks such as bed making with out patient in it, moving furniture and pulling equipments. It was also found that nurses in present study showed a tendency of high level of burnout, the work induced stressors was also high in wardboys. Majority of HCWs were moderately satisfied with their job.

Section VIII

Physiological cost of work

Physiological cost of work is defined as the heart rate, energy expenditure, total cardiac cost of work, and postural stress involved in performing various activities in hospital. For the collection of the experimental data on physiological cost of work 10 percent of selected sample of 120 HCWs i.e. 12 were selected (6 nurses and 6 ward boys). These HCWs had normal blood pressure, pulse rate and were having approximately same age, height, and weight and body mass index. These HCWs were selected from medicine ward, and surgery ward as most of the nurses and wardboys selected for the present study worked in these areas at the time of study and in wards HCWs were directly involved with patients and perform patient handling tasks and non patient handling tasks. For the present study physiological cost of work was examined in terms of heart rate, total cardiac cost of work, energy expenditure, postural stress and physical fitness index. To examine physiological cost of work three replications were taken.

Physical Fitness Index of the experimental group on the basis of step stool ergometer

Physical Fitness Index (PFI) is an important parameter. It denotes an individual's ability to accomplish a give task in a given time. It is necessary because with the help of physical fitness test we can select fit subjects for experimental work and reduce the bias in data based on physical fitness. Physical fitness index of selected HCWs were examined with the help of step –stool ergometer. First of all selected HCWs were given enough of rest and then their resting heart rate was measured with the help of heart rate monitor (Polar Heart rate monitor). After complete rest, the HCWs were asked to do the stepping

activity on the step-stool ergometer. During the stepping activity heart rate of the HCWs was recorded for the entire stepping period with an interval of one minute each.

Table: - 4.8.1. Physical fitness index of the experimental group

S.no	Physical fitness index (PFI)	Nurses n=6	Wardboys n=6	Total N=12
1	Poor (Up to 80)	-	-	-
2	Low average (81 – 100)	1 (16.66)	1 (16.66)	2 (16.66)
3	High average (101 – 115)	3 (50.00)	2 (33.33)	5 (41.66)
4	Good (116 – 135)	2 (33.33)	1 (16.66)	3 (25.00)
5	Very good (136 – 150)	-	2 (33.33)	2 (16.66)
6	Excellent (beyond 150)	-	-	-

- Physical Fitness Index (PFI) $= \frac{\text{Duration of stepping}}{\text{Sum of I, II, III min recovery count}} \times 100$

** Figure in parenthesis represents percentage

After 5 minutes of stepping activity, the HCWs was asked to sit on the resting chair and their recovery pulse rate for 5 minute at an interval of one minute each was again recorded in the same way then the physical fitness score was calculated according to prescribed formula (ACRIP, 2001).

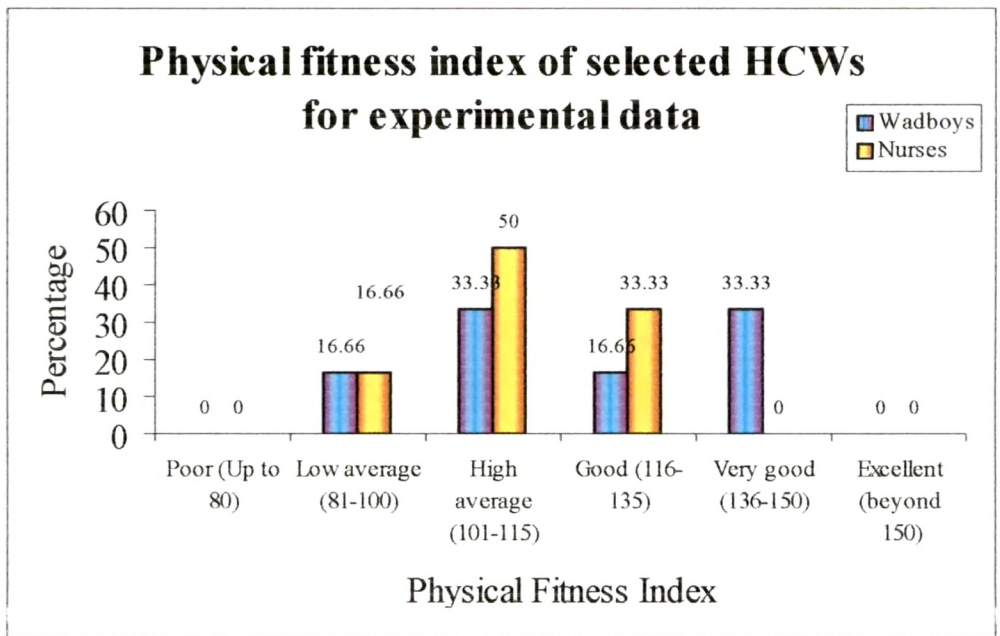


Fig 4.4: Distribution of HCWs on the basis of Physical fitness index

From table 4.8.1 it was evident that out of total 41.66 percent were having high average (101-115) PFI and only 16.66 percent were having very good PFI (136-150). None of the HCWs were having excellent (beyond 150), and poor (upto80) PFI. Among selected nurses 50 percent were having high average PFI (101-115). Where as in wardboys 33.33 percent were having very good (136-150) physical fitness Index and another 33.33 percent were having high average (101-115) Physical fitness Index. Physical fitness index of selected HCWs ranged from 98-136.

Heart Rate (beats/min) of selected HCWs while performing activities in hospital (Table 4.8.2)

Heart Rate (beats/min) is the number of ventricular beats per minute. It is a sensitive and fine discriminating measure for evaluating strain in muscular work.

In addition to this, heart rate can be measured and analyzed easily in practice without any disturbance to the worker by using radio telemetric equipment. Therefore, heart rate has been taken as an evaluation measure for setting the rest allowance, which compensate for the fatiguing effect or physical strain.

In many types of work, the increase in heart rate is linear with the increase in physiological cost of work. Many researchers have showed that the rate of a person's heart rate increases significantly when the person performs a physical task or simply when the person is anxious about the outcome of a particular situation in which he/she is involved. There are certain factors, which affect the heart rate of person like prolonged exercise in a hot environment; Emotional factors, nervousness and apprehension may also affect the heart rate at rest and during work of light and moderate intensity.

Physiological cost in terms of heart rate (beats/min) of selected HCWs was recorded while performing different patient handling tasks and non-patient handling tasks. The data was recorded in three conditions before, during and after the work. Selected HCWs were asked to take rest for 5 min before starting the activity and data were recorded after each min. Then the HCWs were asked to perform the activity and data was recorded for 5 min and then they were asked to take rest for 5 min for recovery of their heart rate after the activity.

From table 4.8.2 it was observed that heart rate of selected HCWs increased while performing various patients handling tasks and non-patient handling tasks in hospital. For the present study three patient handling tasks i.e lifting a patient from lying to sitting on a bed, making a bed with patient in it and dressing on bed and three non patient handling tasks i.e bed making, pulling equipment, and moving

Table: - 4.8.2 Physiological cost of work in terms of Heart rate (beats/min)

S.no	Activity	Mean resting heart rate (Beats/min)		Mean working heart rate (Beats/min)		Mean recovery heart rate (Beats/min)		Percentage increase in working heart rate over resting heart rate	
		Nurses n=6	Wardboys n=6	Nurses n=6	Wardboys n=6	Nurses n=6	Wardboys n=6	Nurses n=6	Wardboys n=6
A	**Patient handling task**								
1	Lifting a patient from lying to sitting on abed	77.25	82.14	98.66	98.07	94.41	91.73	22.21	11.67
2	Making abed with patient in it	80.74	80.83	105.83	104.49	100.16	95.89	24.05	18.63
3	Dressing on bed	75.45	79.49	96.83	98.90	92.24	94.65	22.18	19.07

S.no	Activity	Mean resting heart rate (Beats/min)		Mean working heart rate (Beats/min)		Mean recovery heart rate (Beats/min)		Percentage increase in working heart rate over resting heart rate	
		Nurses n=6	Wardboys n=6	Nurses n=6	Wardboys n=6	Nurses n=6	Wardboys n=6	Nurses n=6	Wardboys n=6
B	**Non- patient handling tasks**								
1	Bed making	80.58	78.82	110.95	97.41	101.33	94.99	25.75	20.51
2	Pulling equipment	79.58	79.24	98.66	93.74	94.75	91.83	19.06	15.88
3	Moving furniture (Chair)	79.08	81.83	102.74	99.41	95.83	94.91	21.18	15.98

* Percentage increase = $\frac{\text{after activity} - \text{before activity}}{\text{Before activity}} \times 100$

furniture i.e. chair were selected because these were the high risk activities. While performing these activities most of HCWs experienced musculoskeletal symptoms in most of the body parts i.e neck, shoulder, elbow/forearm, upper back, lower back, hips/ thigh etc and the extent of pain they experienced was also severe in most of the cases.

A. Patient Handling tasks

1. Lifting a Patient from lying to sitting on a bed

It was observed that the percentage increase in heart rate while performing this activity was 22.21 percent in nurses which was more in comparison to the percentage increase in heart rate of wardboys (11.67) while performing the same activity.

2. Making a bed with patient in it

While making a bed of patient when patient was in the bed the mean heart rate of nurses was 105.83 beats/min and the mean heart rate of ward boys was 100.16 beats/min. It was noted that the percentage increase in heart rate was more in nurses than in ward boys. The percentage increase in heart rate of nurses was 24.05 percent and of wardboys was 18.63 percent.

3. Dressing on bed

When dressing patient on bed by selected HCWs the percentage increase in heart rate of nurses was 22.18 percent and of ward boys was 19.07 percent.

B. **Non-patient Handling tasks**

1. Bed Making

It was found that the mean heart rate while performing this activity was 111.99 beats/min in nurses and 97.41 beats/min in ward boys. The percentage increase in heart rate was 25.75 percent among nurses, which was somewhat higher than the percentage increase in heart rate of wardboys i.e. 20.51 percent.

2. Pulling Equipment

The result of the study showed that the percentage increased in heart rate was 19.06 percent in nurses and 15.88 percent in wardboys. Again the percentage increase in heart rate was high among nurses as compared to ward boys.

3. Moving Furniture i.e. chair

While moving the furniture i.e. chair the percentage increased in heart rate was 21.18 percent in nurses and 15.98 percent in ward boys. The percentage increased in heart rate was more in nurses as compared to ward boys.

From the present study it was observed that heart rate increased during the activity. It was found that the percentage increased in heart rate was high in nurses as compared to ward boys. The percentage increased in heart rate was greater when nurses perform certain activities like making a bed with patient in it (24.05)and among wardboys it was maximum while dressing of patient on bed. It was lowest while pulling equipment (19.06) among nurses and while lifting a patient from lying to sitting on a bed (11.67) among ward boys.

Thus from the over all analysis it was concluded that there was a gender differences in the percentage increased in heart rate. It was found to be greater in nurses than in ward boys because ward boys were more physically strong as

Plate 4.1. Nurse lifting a patient from lying to sitting on bed

Plate 4.2. Wardboys making bed of patient when patient was in the bed

Plate 4.3 Wardboy making bed for patient

Plate 4.4 Wardboy pulling stretcher with stand

compared to nurses, their stamina to withstand the physical exertion is more because of this they performed various activities without much physical stress and strain to themselves as compared to nurse that's why they performed different activities in hospital without much increase in their heart rate. All values were within acceptable limits.

Physiological cost of work in terms of energy expenditure (kJ/min)

Energy is required for various kinds of biological activities done by all living organisms. As soon as physical work is performed, energy expenditure rises sharply. The greater demand made on the muscles, the more the energy is consumed. The increased consumption of energy associated with a particular activity expressed in work calories and is obtained by measuring energy consumption while working and subtracting form this the energy consumption during rest. Muscles provide the energy in the human body. Muscles have a property of contraction, a process in which chemical reaction takes place changing energy rich phosphate compounds adenosine-tri-phosphate (ADP). This energy expenditure in kJ/minute indicate the level of bodily stress and in relation to work and can be used to assess the rest periods, different ways of arranging work and compare the efficiency of different tools. Hence, energy expenditure should be used as a measure for strenuous physical effort rather than for mental activities. In a very broad sense, physical performance of fitness of an individual is determined by his capacity of energy output (aerobic and anaerobic processes and oxygen transport), neuromuscular function (muscle strength, co-ordination and technique), joint mobility and psychological factors (motivation and tactics).

Health care workers working in hospitals have to perform various patient-handling tasks and non-patient handling tasks. Therefore, in table 4.8.3 an attempt was made to calculate the energy expenditure (kJ/min) between various PHT and NPHT.

The energy expenditure was calculated by using following formula:

Energy Expenditure (kJ/min) =0.159X working heart rate (beats/min) – 8.72

It is described under following sub headings

A. Patient Handling Tasks

1. Lifting a patient from lying to sitting on bed

It was observed that when HCWs perform this activity mean energy expenditure before activity among nurses, was 3.56 (kJ/min), during activity was 6.89 kJ/min and after activity was 6.28 kJ/min. Among wardboys, the mean energy expenditure before activity was 4.22 (kJ/min), during activity was 6.87 kJ/min and after activity was 5.85 kJ/min. Table 4.7.3 also throw light on percentage increased in energy expenditure while performing activity. It was observed that when nurses lifted a patient from lying to sitting on bed, percentage increased in energy expenditure was 76.40 where as when wardboys perform this activity the percentage increase in energy expenditure was 35.10. Percentage increase in energy expenditure was more in nurses.

2. Making a bed with patient in it

When nurses make a bed while patient was in bed, mean energy expenditure before activity was 4.11 kJ/min, during activity was 8.10 kJ/min and after activity was 7.20 kJ/min where as, when wardboys perform this activity the mean energy expenditure before activity was 4.12 kJ/min, 7.25 kJ/min during the activity and after activity it was 6.50 kJ/min. It was found that the percentage increase in

Table 4.8.3 Physiological cost of work in terms of Energy Expenditure (kJ/min)

S.no	Activity	Before work Energy Expenditure (kJ/min)		During work Energy Expenditure (kJ/min)		After work Energy Expenditure (kJ/min)		Percentage increase in Energy Expenditure	
		Nurses n=6	Wardboys n=6	Nurses n=6	Wardboys n=6	Nurses n=6	Wardboys n=6	Nurses n=6	Wardboys n=6
A	**Patient handling task**								
1	Lifting a patient from lying to sitting on abed	3.56	4.33	6.89	6.87	6.28	5.85	76.40	35.10
2	Making abed with patient in it	4.11	4.12	8.10	7.25	7.20	6.5	75.18	57.76
3	Dressing on bed	3.30	3.87	6.78	6.65	5.94	5.86	80.00	51.42
B	**Non- patient handling tasks**								
1	Bed making	4.04	3.80	9.08	6.76	7.38	6.38	82.67	67.89

Cont....

S.no	Activity	Before work Energy Expenditure (kJ/min)		During work Energy Expenditure (kJ/min)		After work Energy Expenditure (kJ/min)		Percentage increase in Energy Expenditure	
		Nurses n=6	Wardboys n=6	Nurses n=6	Wardboys n=6	Nurses n=6	Wardboys n=6	Nurses n=6	Wardboys n=6
2	Pulling equipment	4.00	3.87	7.79	5.78	6.95	5.13	73.75	72.55
3	Moving furniture (Chair)	3.85	3.89	7.61	6.68	6.51	6.52	69.09	67.60

* Energy expenditure (kJ/min) + 0.159 x working heart rate (beats /min) – 8.72

* * Percentage increase = $\frac{\text{after activity} - \text{before activity}}{\text{Before activity}} \times 100$

energy expenditure was 75.18 among nurses and 57.76 percent among ward boys. It was noted that energy expenditure was more in nurses as compared to wardboys while performing this activity.

3. Dressing in bed

It was observed that when dressing of patient was done in bed mean energy expenditure before activity was 3.30 kJ/min, during activity was 6.78 kJ/min and after activity was 5.94 kJ/min in nurses and in wardboys mean energy expenditure before activity was 3.87 kJ/min, during activity was 6.65 kJ/min and after activity was 5.86 kJ/min. Eighty percent increase in energy expenditure was seen in nurses and in ward boys it was 51.42 percent.

B. **Non Patient Handling tasks**

1. Bed Making

It was found that when the activity of bed making was carried out, mean energy expenditure among nurses before activity was 4.04 kJ/min, during activity was 9.08 kJ/min and after activity was 7.38 kJ/min. Among wardboys mean energy expenditure while performing bed making was 3.80 kJ/min before activity, 6.76 kJ/min during activity and 6.38 kJ/min after activity. Percentage increase in energy expenditure among nurses was 82.67 percent where as in wardboys it was 67.89 percent.

2. Pulling Equipment

Mean energy expenditure before the activity of pulling equipment among nurses was 4.00 kJ/min, during activity it was 7.79 kJ/min and after activity it was 6.95 kJ/min. In wardboys mean energy expenditure before activity was 3.87 kJ/min, 5.78 kJ/min during activity and 5.13 kJ/min after activity. In nurses

percentage increase in energy expenditure was 73.75 percent on the other hand it was somewhat similar 72.55 percent among ward boys.

3. **Moving Furniture**

It was examined that when the activity of moving furniture i.e. chair was done by nurses, mean energy expenditure before activity, during activity and after activity were 3.85 kJ/min, 7.61 kJ/min and 6.51 kJ/min. When this activity was done by wardboys, mean energy expenditure before, during and after activity was3.89 kJ/min, 6.68 kJ/min and 6.52 kJ/min 69.09 kJ/min. Percentage increase in energy expenditure was 69.09 percent in nurses and 67.60 percent in wardboys.

Heavy work in any activity leads to greater physical exertion and is characterized by a high energy consumption and severe stress on the heart and lungs. Energy consumption and cardiac capacity set limits to the performance of heavy work and these two functions are often used to access the degree of severity of a physical work (Grandjean, 1988). As soon as physical work is performed, energy consumption rises sharply. The greater the demands made on the muscles by one occupation the more energy consumed. The increased consumption associated with a particular activity was expressed in work calories or kilo Jule. These work calories indicate the level of body stress. Hence energy expenditure should be used as a measure of comparison only for strenuous physical efforts and never for studying mental activities. Many researchers have shown that a healthy occupation should involve a daily energy consumption of 3000-3500 kcal for a man, with 2500-3000 kcal for women (Swaminathan, 1991).

From the finding of the present study it was found that the percentage increase in energy expenditure in nurses during dressing of patient on bed was 80.0 kJ/min and during bed making was 82.67 kJ/min, was highest while performing these activities. Where as among Wardboys percentage increase in energy expenditure

was highest while making bed with patient in it 57.76 kJ/min and while pulling equipment 72.55 kJ/min.

Energy expenditure was lowest while moving furniture i.e. chair (69.09) in nurses and in ward boys it was lowest while lifting a patient from lying to sitting on a bed (35.10).

Thus, from the entire analysis it could be concluded that the energy expenditure was greater in nurses as compared to ward boys while performing same patient handling tasks and non-patient handling tasks.

Physiological cost of work in terms of total cardiac cost of work (T.C.C.W) (table 4.8.4)

Total cardiac cost of work was calculated by using the following formula:-

T.C.C.W = C.C.W + C.C.R

Cardiac cost of work (C.C.W) = AHR_1 X Duration

(AHR_1 = Average working – Average Resting heart rate).

Cardiac cost of Rest (C.C.R) = AHR_2 X Duration.

(AHR_2 = Average Recovery – Average Resting heart rate).

Total cardiac cost of work (T.C.C.W) was analyzed and reported in table 4.7.4

A. **Patient handling tasks**

1. Lifting a Patient from lying to sitting on a bed

It was observed that while lifting a patient from lying to sitting on bed by nurses, mean T.C.C.W was 192.85 beats/min and T.C.C.W was 127.55 beats/min in wardboys.

Table: - 4. 8.4 Physiological cost of work in terms of total cardiac cost of work (T.C.C.W)

S.no	Activity	Total cardiac cost of work (T.C.C.W) Beats/min	
		Nurses n=6	Wardboys n=6
A.	**Patient handling tasks**		
1	Lifting a patient from lying to sitting on a bed	192.85	127.55
2	Making abed with patient in it	222.55	193.60
3	**Dressing in bed**	190.45	172.85
B	**Non-patient handling tasks**		
1	Bed making	260.80	173.80
2	Pulling equipment	171.25	135.45
3	Moving furniture (Chair)	202.05	153.30

- Total cardiac cost of work (T.C.C.W) + C.C.W + C.C.R
- Cardiac cost of work (C.C.W) =AHR1 x duration
  (AHR1= Average working heart rate – average resting heart rate)
- Cardiac cost of rest (C.C.R) = AHR2 x duration
  (AHR2 = Average recovery heart rate – average resting heart rate)

2. Making a bed with Patient in it

It was examined that while making a bed with patient in it by nurses, mean T.C.C.W was 222.55 beats/min, which was 193.6 beats/min.

3. Dressing in bed

When dressing of patient was done on bed by nurses, T.C.C.W during dressing was 190.45 beats/min and in wardboys T.C.C.W was 172.85 beats/min.

B. Non-patient handing tasks

1. Bed Making

Mean T.C.C.W was 260.8 beats/min when nurses performed bed making activity and when wardboys performed the similar job the T.C.C.W was 173.8 beats/min.

2. Pulling Equipment

It was found that T.C.C.W was 171.25 beats/min when nurses pulled the hospital equipment and was 135.45 beats/min when ward boys pulled the equipment.

3. Moving Furniture i.e. chair

It was noted that during the activity of moving furniture i.e. chair T.C.C.W among nurses and wardboys was 202.05 beats/min and 153.3 beats/min respectively.

Thus from the over all analysis it concluded that overall total cardiac cost of work was greater when nurses perform the patient handling task and non-patient handling task as compared to ward boys.

While performing patient handling tasks total cardiac cost of work was highest when nurses and ward boys made bed for patient with patient in it (222.55 beats/min and 193 beats/min respectively) and T.C.C.W was lowest when nurses performed dressing of patient in bed (190.45 beats/min) and ward boys lifted a patient from lying to sitting on a bed (127.55 beats/min).

Where as while doing non- patient handling tasks total cardiac cost of work was highest when both wardboys and nurses performed bed-making activity i.e.260.8 beats/min and 173.8 beats/min. Where as T.C.C.W was lowest while pulling equipment, nurses as well as in ward boys (171.25 beats/min and 135.45 beats/min respectively).

Physiological cost of work in terms of postural stress while performing various patient handling tasks and non-patient handling tasks (table 4.8.5)

A good posture is one, which can sustain a minimum of static effort and which allows the subject to perform the given task more effectively and with least muscular stress. There is a positive relation in the angle of body movement musculoskeletal problems and energy expenditure have shown that the more the trunk is inclined forward the higher were stress values at the lumbo sacral joints.

Back injuries was widely believed to be one of the most frequent occurring maladies among health care workers (Rogers and Savage, 1988; Queensland Department of Health, 2000) of the musculoskeletal injuries reported among HCWs, injuries to the back are most frequently observed (Smedley *et.al,* 1997 and Garg *et.al*, 1992).

Postural stress on selected HCWs was measured with the help of flexi curue.
The shape of the spinal cord was taken two times:-

1. Normal curve:- before starting the activity
2. While performing various patient handling tasks and non-patient handling task.

The table 4.8.5 shows the deviation in the angles of spinal cord (upper back and lower back) that form the normal curve while performing various patient handling tasks and non-patient handling tasks. It was studied from the relevant sources that, when there is 15^0 deviation in the angle of spinal cord from that of the normal curve, stress is experienced on the spinal cord (cited from Datar, 2003).

The intensity of pain in body parts was measured with the help of suitable body map.

A. Patient handling Tasks

The results of the study showed that the mean angle of normal curve was 205 degree in upper portion and 197^0 in the lower portion in nurses and in wardboys the mean normal angle of upper portion was 208^0 and lower portion was 200^0.

It was found that the deviation in angle of spinal cord (upper portion) was maximum in both nurses and wardboys while making a bed with patient in it, than while lifting a patient from lying to sitting on a bed and deviation in angle of spinal cord (lower portion) was also maximum while making bed with patient in it by nurses where as in wardboys it was maximum while lifting a patient from lying to sitting on a bed.

The percentage deviation in angle of spinal cord was also maximum among nurses and wardboys while lifting a patient from lying to sitting on a bed and while making a bed with patient in it. This was because of adopting different awkward postures while performing these activities. Studies form the literature also identified the similar result that this incidence of postural stress (back pain) among nurses and nursing personnel is associated with patient-handling tasks that involve lifting and carrying patients, bed making and postural stress adopting different postures.

Table: - 4.8.5 Physiological cost of work in terms of Postural stress (angle of deviation) while performing different patient handling tasks and non-patient handling tasks

S.no	Activities	Angle of normal curve (°)		Angle of spinal cord during activity (°)		Deviation in angle of spinal cord (°)		Percentage deviation in angle of spinal cord	
		UB	LB	UB	LB	UB	LB	UB	LB
A	**Patient handling tasks**								
1	Lifting of patient from lying to sitting on bed								
	a. Nurses	205	197	228	203	+23	+6.0	11.21	3.04
	b. Wardboys	208	200	216	212	+8.0	+12	3.84	6.00
2	Making a bed with patient in it								
	a. Nurses	205	197	240	215	+35	+18	17.07	9.13
	b. Wardboys	208	200	225	208	+17	+8	8.17	4.00
3	Dressing in bed								
	a. Nurses	205	197	218	204	+13	+7	6.34	3.55
	b. Wardboys	208	200	215	210	+7	+10	3.36	5.00

Cont....

S.no	Activities	Angle of normal curve (°)		Angle of spinal cord during activity (°)		Deviation in angle of spinal cord (°)		Percentage deviation in angle of spinal cord	
		UB	LB	UB	LB	UB	LB	UB	LB
B	**Non patient handling tasks**								
1	Bed making								
	a. Nurses	205	197	227	212	+25	+15	10.73	7.61
	b. Wardboys	208	200	212	210	+4	+10	1.92	5.00
2	Pulling equipments								
	a. Nurses	205	197	220	205	+15	+8	7.31	4.06
	b. Wardboys	208	200	224	211	+16	+11	7.69	5.50
3	Moving furniture i.e chair								
	a. Nurses	205	197	216	204	+11	+7	5.36	3.55
	b. Wardboys	208	200	212	206	+4	+6	1.92	3.00

UB= Upper back
LB= Lower back

*Angle of deviation (°) = angle of spinal cord during activity – angle of normal curve

* * Percentage deviation in angle of spinal cord = after activity – before activity x100
Before activity

(Magora, 1970; Ferguron, 1970; Cust *et.al,* 1972; Dehlin *et.al,* 1976; Bell *et.al* ,1979; Raistrick, 1981; Stubbs *et.al* 1983; Vildeman *et.al,* 1984; Klien *et.al,* 1984; Harber *et.al,* 1985; Jensen ,1985; Owen ,1985; Wood 1986; Arad and Nyran, 1986; Owen 1987; Harber 1989; Hedge 1998; Persönick;1990; Jensen 1990; Garg. *et.al* ,1992; Smedley *et.al* ,1995 ;Smedley 1997).

Non-Patient handling tasks

It was observed that while performing non-patient handling tasks the deviation in angle of spinal cord (upper and lower portion) among nurses was maximum while making bed and among wardboys it was maximum while pulling equipment.

Extent of pain experienced by HCWs while performing various activities in hospital

The incidence of musculoskeletal symptoms during the activity was measured with the help of body map. The body map with specification of pain in different body parts suggest the value from 1-5 viz. 1-very mild, 2-mild, 3-moderate, 4-severe and 5-very severe, was used to quantify the stress on the muscles. On the basis of the level of pain experienced by HCWs were asked to respond on three point continuum i.e. severe pain, moderate pain and mild pain. (Table 4.8.6)

A. **Patient Handling task**

1. **Lifting a patient form lying to sitting on bed**

It was observed that while lifting a patient from lying to sitting on bed, nurses were suffered form severe pain in neck, upper back, lower back, shoulders and knee, moderate pain in hip/thigh and mild pain in elbow/forearm, hand/wrist, ankle, foot. Where as wardboys were suffered form severe pain in shoulder, upper

Table 4.8.6 Extent of pain experienced by HCWs while performing different activities in hospital

S.no.	Activity	Extent of Pain									
		Neck	Shoulder	Elbow /forearm	Hand/wrist	Upper Back	Lower Back	Hip/thigh	Knee	Ankle	Foot
A	**Patient Handling tasks**										
1.	Lifting a patient from lying to sitting on bed.										
	Nurses	3	3	1	1	3	3	2	3	1	1
	Wardboys	3	3	2	1	3	2	2	2	2	1
2.	Making a bed with Patient in it										
	Nurses	3	3	2	1	3	3	3	2	1	1
	Wardboys	3	2	2	2	2	3	2	3	1	1
3.	Dressing on bed										
	Nurses	3	3	2	1	2	3	2	1	1	1
	Wardboys	3	2	2	1	2	2	3	2	1	1
B	**Non patient handling tasks**										
1	Bed Making										
	Nurses	3	3	2	2	3	3	3	3	2	1
	Wardboys	3	2	2	2	2	3	3	2	2	2
2..	Pulling equipment										
	Nurses	1	1	1	2	2	2	1	1	1	1
	Wardboys	2	2	1	2	2	3	3	3	1	1
3.	Moving Furniture										
	Nurses	2	2	2	2	2	3	1	2	2	2
	Wardboys	2	2	1	1	1	3	3	3	1	1

1- Mild, 2 – Moderate, 3- Severe

back, and knee and moderate pain in neck, elbow/forearm, lower back, hip/thigh and ankle, mild pain in hand/wrist and foot.

2. Making a bed with patient in it

While making a patient bed when patient was in the bed severe pain in neck, shoulder, upper back, lower back, hip/thigh was experienced by nurses. The moderate pain was experienced in elbow/forearm and knee and mild pain in hand/wrist and foot.

3. Dressing on bed

It was found that severe pain was experienced by nurses in neck, lower back and shoulder while dressing up patient on bed. Where as they felt moderate pain in elbow/forearm, upper back, and hip and thigh and mild pain in hand/wrist, knee, ankle and foot.

When wardboys performed this activity they experienced severe pain in neck, shoulder and hip/thigh; moderate pain in elbow/forearm, upper back, lower back and knee and mild pain in ankle and foot.

Non-Patient handling tasks

1. Bed Making

During making a bed for patient nurses had severe pain in neck, shoulder, upper back, lower back, hip/thigh and in knee; moderate pain in hand/wrist and ankle and they experience mild pain in foot and wardboys experienced severe pain in neck, lower back, and hip/thigh; moderate pain in shoulder, elbow/forearm, hand/wrist, upper back, knee, ankle and foot. Nurses experienced moderate pain because this activity was more frequently performed by wardboys as compared to nurses.

Fig. 4.5 Extent of Pain experienced by HCWs while performing different activities in hospital

Patient Handling Tasks

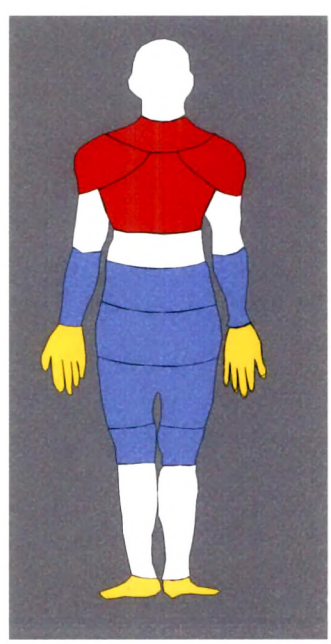
1. Lifting a patient from lying to sitting on bed

Severe Pain

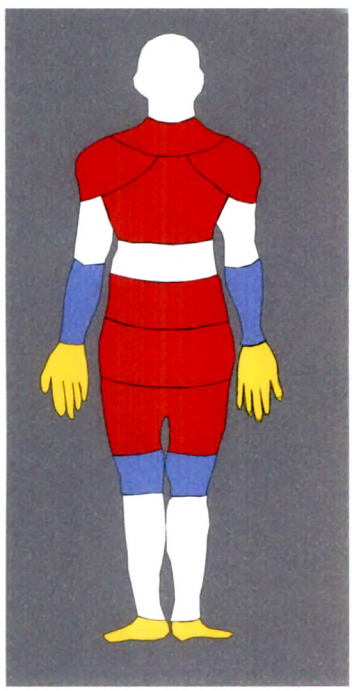
Moderate Pain

Mild Pain

1. Nurses



2. Wardboys



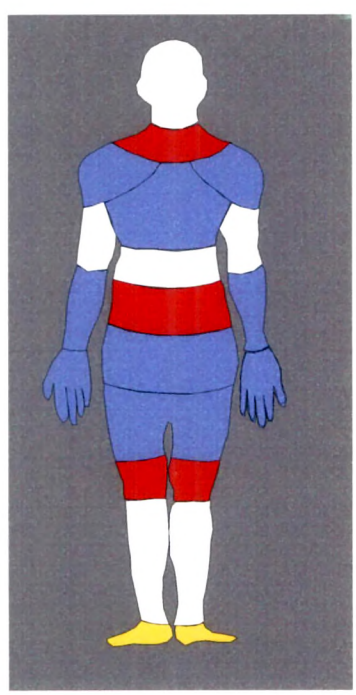
1. Nurses

2. Making a bed with patient in it

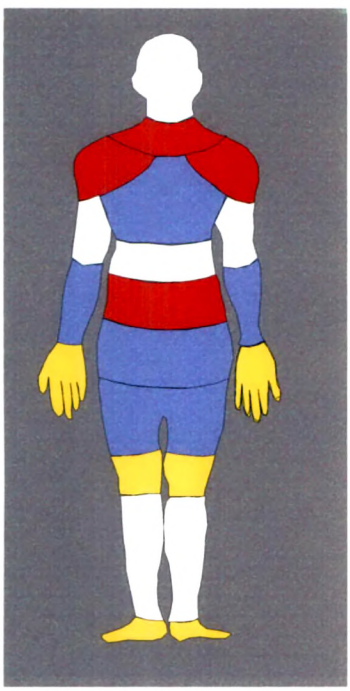
Severe Pain

Moderate Pain

Mild Pain



2. Wardboys



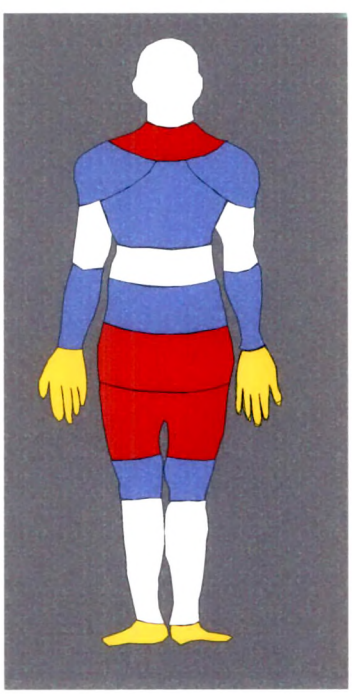
1. Nurses

3. Dressing of Patient on Bed

Severe Pain

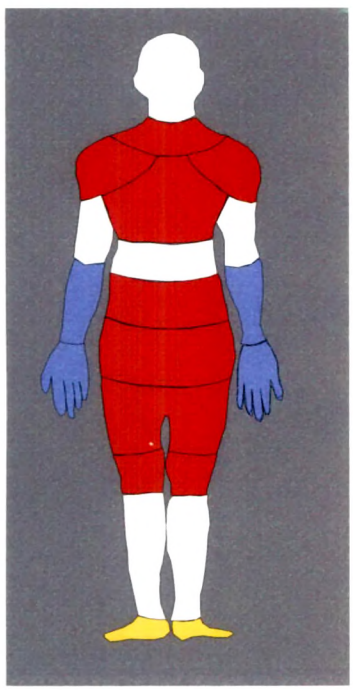
Moderate Pain

Mild Pain



2. Wardboys

Non Patient handling tasks



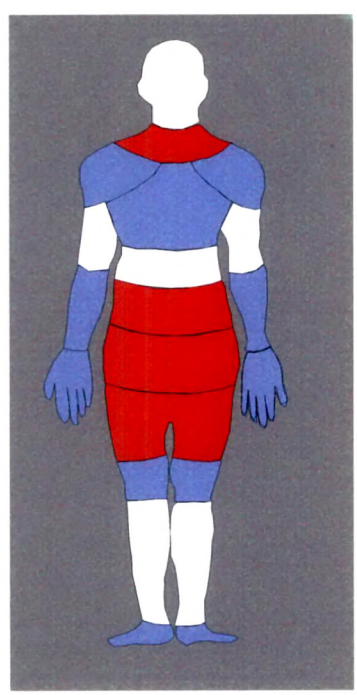
1. Bed Making

Severe Pain

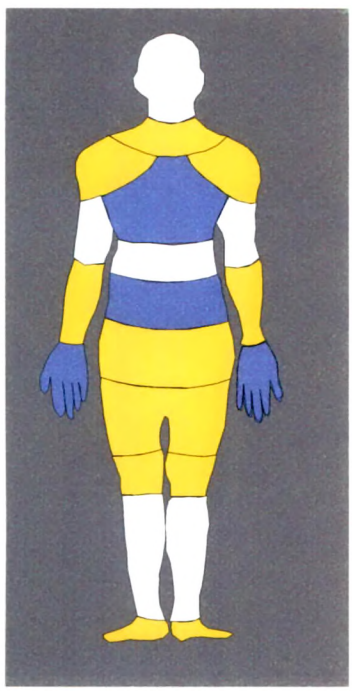
Moderate Pain

Mild Pain

1. Nurses



2. Wardboys



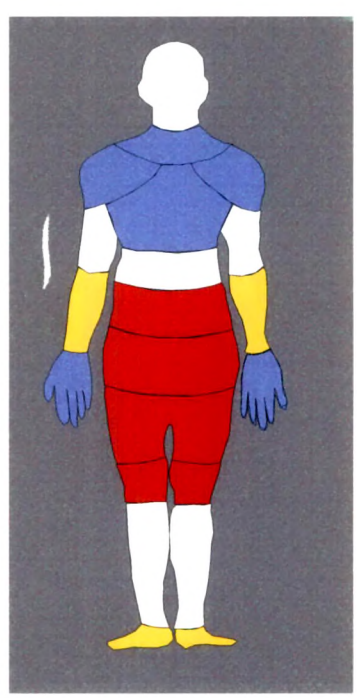
1. Nurses

2. Pulling Equipments

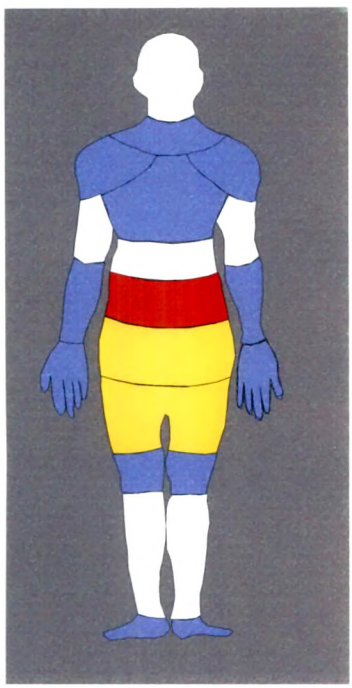
Severe Pain

Moderate Pain

Mild Pain



2. Wardboys



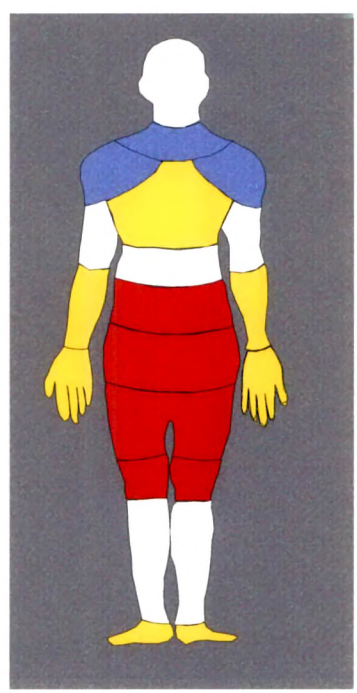
1. Nurses

3. Moving Furniture

Severe Pain

Moderate Pain

Mild Pain



2. Wardboys

2. Pulling equipment

It was noted that HCWs i.e. nurses did not experienced severe pain in any part of body while pulling equipment in hospital. They experienced moderate pain in hand/wrist, upper back, and in lower back, and mild pain neck, shoulder, elbow/forearm, hip/thigh, knee ankle and foot. Where as wardboys experienced severe pain in lower back, knee and hip/thigh and they experience moderate pain in shoulder, hank/wrist, neck, elbow and forearm and upper back.

3. Moving furniture

The severe pain was experienced by nurses in lower back and in neck, shoulders elbow/forearm, hand/wrist, upper back, knee, ankle and foot they experienced moderate pain.

When wardboys moved the furniture they experienced severe pain in hip/thigh, lower back and knee and moderate pain in neck and shoulder and mild pain elbow/forearm, hand/wrist, upper back, ankle and forearm. This was because of there awkward posture for any length of time while performing these activities. The cause of this pain may be because of understaffing, lack of regular training programs in proper procedures for lifting and other work motions and in adequate general safety precautions, standing for long periods of time, too much weight on one leg. Unbalanced weight distribution, with resultant strain may produce pain in the back, legs and feet.

Thus from the results of physiological cost of work it was concluded that the percentage increase in heart rate and energy expenditure was found to be maximum in nurses when they performed activities such as making bed with patient in it and among wardboys it was high when they performed activity of dressing a patient in bed. The percentage deviation in angle of spinal cord was also maximum among nurses while performing activities such as lifting patient from lying to sitting on bed with patient in it and bed making without patient in the bed.

It was found that nurses were more prone to physiological hazards as the physiological cost of work in terms of heart rate, energy expenditure, postural stress and total cardiac cost of work was high in them as compared to wardboys. This may affect their heart and posture in future because of these high risk activities if precautions were not taken by them in the early stage.

Section IX

Testing of Hypotheses

A number of hypotheses were formulated on the basis of objectives of the study. For the purpose of statistical analysis, these hypotheses were formulated in the null form. The following null hypotheses were tested by employing appropriate statistical tests.

$H0_1$:- There is no relationship between the selected work and worker- related variables and physiological cost of work i.e. musculoskeletal symptoms.

$H0_2$:- There is no relationship between the selected work and worker- related variables and psychological cost of work.

$H0_3$:- There is no relationship between selected worker related variables and physiological cost of work in terms of :-

5. Heart rate
6. Energy expenditure
7. Postural stress
8. Physical fitness Index

$H0_4$:- There is no relationship between Heart rate and energy expenditure of selected HCWs while performing various activities in hospital.

Ho1: There is no relationship between the selected work and worker-related variables and physiological cost of work i.e. musculoskeletal symptoms

A. Worker Related variables are

1. Age (Years)
2. Education
3. Marital Status
4. B.M.I
5. Height
6. Weight

B. Work related variables are

1. Years of working
2. Working Hours
3. Work Schedule
4. Work place

One-way Analysis of Variance and Z-test was calculated to test this hypothesis. F-ratio and calculated value of Z were found to be smaller than the tabulated value. (5% i.e. 3.07, 1 %-4.75 and R: /Z/>/1.96 at 5 % level of significance). Hence the null hypothesis was accepted. It could be concluded that there was no significant

Table 4.9.1 F- values and Z- values showing relationship between the selected work and worker- related variables and physiological cost of work i.e. musculoskeletal symptoms

S. No.	Variables/Activities	Patient Handling tasks		Non-Patient handling tasks	
A	**Worker Related variable**	**Nurses**	**wardboys**	**Nurses**	**wardboys**
1	Age (years)	0.67	0.99	0.02	0.04
2	Education	0.64	0.76	0.78	0.45
3	Marital status	1.64	0.81	0.02	0.04
4	BMI	1.76	0.45	0.47	0.35
5	Height	1.02	1.62	0.67	0.08
6	Weight	0.28	0.45	0.92	0.72
B	**Work Related variables**				
1	Years of working	0.08	0.96	0.81	0.88
2	Working Hours	0.65	0.85	0.12	0.11
3	Work Schedule	0.001	0.35	0.11	0.67
4	Work Place	0.47	1.46	0.42	0.08

relationship between the selected work and worker related variables and physiological cost of work i.e. musculoskeletal symptoms while performing various patient handling tasks and non-patient handling tasks by nurses and wardboys (table4.9.1). Therefore the null hypothesis ($H0_1$) was accepted. Although there was no significant relationship between work and worker related variables and physiological cost of work but the HCWs showed medical history of back pain. The frequency of HCWs who suffered from musculoskeletal symptoms

was very less but if it was not given attention it may be high risk to their health in future.

$H0_2$: There is no significant relationship between selected work and worker related variables and psychological cost of work 1.burn out, 2. work stress and 3. job satisfaction.

To test the hypothesis statistically one way Analysis of Variance was used for all variables and Z- test was used for variable marital status. The decision about the significance was taken by comparing the calculated value of F-ratio and Z-test with the table value at (5% i.e. 3.15, 1 %-4.98 and R: /Z/>/1.96 at 5 %) level of significant. The psychological cost of work was measured in terms of (1) Burnout, (2) Work stress, (3) Job satisfaction. Findings are presented separately for each.

(1) Burn out

A. **Worker Related variables**

It was observed that there was a significant relationship between age of nurses, marital status of nurses and wardboys, BMI of nurses and wardboys and emotional exhaustion and depersonalization (EF+DP) scores; between age of nurses and wardboys, marital status of nurses and wardboys, BMI of wardboys, weight of nurses and personal accomplishment (PA) scores; between marital status of nurses and wardboys and Physical exhaustion (PE) scores (table 4.9.2). There was non significant relationship between age of wardboys and weight of nurses and wardboys and Emotional exhaustion and depersonalization (EF+DP) scores and Physical exhaustion (PE); between education and height of nurses and wardboys and all the sub scale score of burnout; BMI of nurses and wardboys and PE scores. Therefore the hypothesis was partially rejected. Thus it could be concluded that age, marital status, BMI affected the sub scale factors of burnout.

Table 4.9.2 F- Values and Z- values showing relationship between selected work and worker related variables and psychological cost of work (1) burn out

S.no	Variables						
1	Burnout	EE+DP		PA		PE	
A	Worker related variables	Nurses	wardboys	Nurses	wardboys	Nurses	wardboys
1	Age (years)	3.46*	1.26	3.28*	5.72**	1.76	0.98
2	Education	0.45	0.68	1.76	1.42	0.99	0.42
3	Marital status	6.02***	4.56***	5.00***	5.02***	6.72***	4.78***
4	BMI	4.30*	3.72*	2.00	3.15*	1.79	1.02
5	Height	1.72	0.88	0.78	1.76	0.08	0.72
6	Weight	2.00	1.78	3.50*	1.48	2.56	1.50
B	Work related variables						
1	Years of working	4.78*	6.72**	4.72*	3.86*	1.72	0.52
2	Working Hours	2.53	2.50	2.78	2.86	2.72	3.10*
3	Work Schedule	0.80	0.11	0.17	0.86	1.02	1.72
4	Work Place	3.72*	3.11*	5.00**	5.62**	0.17	1.82

* **Significant at 5 % level of significance**

** **Significant at 1 % level of significance**

*** **Significant at R/Z/>1.96 5 % level of significance**

B. Work Related variables

The F- values and Z-values showed significant relationship between years of working of nurses and wardboys and Emotional exhaustion and depersonalization (EF+DP) scores and PA scores; between working hours of wardboys and PE

scores and work place and Emotional exhaustion and depersonalization (EF+DP) scores and Personal accomplishment (PA) scores. The relationship was found to be non significant between working hours of nurses and wardboys and EE and DP and PA scores; work schedule and all the sub scale of burnout; between work place and PE scores.

Hence, the hypothesis was partially rejected. It could be concluded that the burn out level was affected by years of working, working hours and work place.

Work stress

1. Worker related variables

The results of computation of ANOVA and Z test showed significant relationship between age of nurses and stress due time and scheduling pattern; between age of nurses and wardboys and stress due to dealing with patients, pay related stress and age of nurses and stress due to interpersonal problem; between marital status of nurses and wardboys and stress due to time and scheduling pattern, pay related stress and stress due to interpersonal problem; and between marital status of wardboys and stress due to dealing with patients; BMI of nurses and wardboys and stress due to time and scheduling pattern, stress due to dealing with patients (table 4.9.3). There was non significant relationship between education, height and weight of nurses and wardboys and sub scale scores of work stress. Therefore, the hypothesis was partially rejected and it could be concluded that work stress was affected by age, marital status, and BMI. (Table 4.9.3)

2. Work related variables

The results showed significant relationship between years of working of wardboys and stress due to time and years of working of nurses and wardboys and scheduling pattern, stress due to dealing with patients, stress due to technical problem and interpersonal problems; between working hours and stress due to time and secluding pattern, stress due to dealing with patients, stress due to interpersonal problem, pay related stress and interpersonal problem and between work schedule of nurses and wardboys and stress due to dealing with patients and related to pay, interpersonal problems and

Table 4.9.3 F – values and Z values showing relationship between selected work and worker related variables and psychological cost of work (2) work stress

S.no	Variables	Time and scheduling pattern		Dealing with patients		Pay related stress		Interpersonal problems		Technical problem		Violence problem	
2	**Work stress**												
A	Worker related variables	N	W	N	W	N	W	N	W	N	W	N	W
1	Age (years)	3.17*	1.72	5.72**	7.62**	5.00**	6.02**	3.17*	3.10	1.72	1.82	1.72	1.45
2	Education	1.10	1.82	0.68	0.80	1.72	0.75	1.88	2.67	1.98	1.72	1.05	0.88
3	Marital status	3.62***	3.11***	2.72***	0.50	5.76	4.78***	5.02***	6.10***	0.80	0.45	0.37	1.62
4	BMI	4.08*	7.62**	3.82*	2.72	1.82	0.88	0.57	0.80	1.46	1.56	1.28	1.35
5	Height	1.46	2.72	0.60	0.11	0.02	0.32	0.48	1.72	0.68	0.70	1.28	1.85
6	Weight	1.82	1.88	2.50	2.78	0.62	0.10	0.11	0.17	0.82	0.56	1.72	1.86
B	**Work Related variables**												
1	Years of working	3.84*	3.02	4.82*	3.08	5.00**	3.42*	3.76*	3.28*	2.82	3.76*	1.45	1.80
2	Working Hours	5.02**	5.00**	4.08*	4.32*	5.76*	4.07*	3.65*	3.45*	3.10	4.20*	1.86	1.70
3	Work Schedule	1.72	1.82	3.30*	3.18*	3.45*	4.62*	1.96	1.08	2.42	1.45	0.80	1.62
4	Work Place	1.28	2.76	2.45	2.62	1.72	0.80	0.92	0.78	1.45	1.06	1.12	1.35

technical problems and work schedule of nurses. There was non significant relationship between work place with sub scale score of work stress.

Thus it could be concluded that year of working, working hours and work schedule affects the work stress. The hypothesis was partially rejected.

Job Satisfaction

1. Worker related variables

The results of computation showed significant relationship between age of wardboys and work schedule scores and age of nurses and occupational status; between age of nurses and work environment; between BMI of nurses and wardboys and work autonomy, work schedule and marital status with work environment, and work schedule scores and between marital status of wardboys and work environment; between height of wardboys with work autonomy. There was non significant relationship found between education and weight of nurses and wardboys and sub scale of job satisfaction. The hypothesis was partially rejected and it could be concluded that age, marital status and BMI affected job satisfaction. (Table : 4.9.4)

2. Work related variables

The results showed that there was a significant relationship between years of working of nurses and work autonomy; between working hours of nurses and wardboys and work environment and occupational status; and between work schedule of nurses and work autonomy; between work place and work schedule and occupational status. There was non-significant relationship between year of working and work schedule and work environment; between working hours and work autonomy and work schedule; between work schedule and work environment; between work place and work autonomy scores of job satisfaction. Hence the hypothesis was partially rejected and it may be concluded that working hours and work place affected the job satisfaction of HCWs

Table 4.9.4. F – values and Z values showing relationship between selected work and worker related variables and psychological cost of work (3) job satisfaction

S.no	variables	Work autonomy		Work schedule		Work environment		Occupational stress	
3.	Job satisfaction	N	W	N	W	N	W	N	W
A	Worker related variables								
1	Age (years)	0.10	0.01	3.80	7.62**	3.12	0.80	4.10*	4.81*
2	Education	1.35	1.72	2.50	2.51	0.82	1.11	1.28	1.76
3	BMI	2.08	2.76	3.45*	4.00*	3.00	2.86	2.00	1.18
4	Marital status	4.52***	6.08***	3.72***	3.00***	1.76	2.82***	1.21	1.76
5	Height	2.42	3.80	1.76	2.87	1.00	1.28	2.08	0.05
6	Weight	1.15	1.62	0.80	1.76	0.45	0.89	1.15	1.62
B	Work related variables								
1	Years of working	3.45*	1.68	0.80	0.45	0.30	1.72	1.45	1.38
2	Working Hours	1.45	0.80	0.10	0.11	3.45*	4.18*	3.15*	6.30**
3	Work Schedule	4.52*	1.78	2.45	1.36	0.38	1.45	0.10	1.76
4	Work Place	2.96	2.00	5.00**	5.10**	1.45	3.35*	4.50*	4.98**

N= Nurses, w= ward boys

*** Significant at 5 % level of significance**

**** Significant at 1 % level of significance**

***** Significant at R/Z/>1.96 5 % level of**

$H0_3$ – There is no relationship between selected worker related variables and physiological cost of work in terms of

1. **Heart rate,**
2. **Energy expenditure**
3. **Postural Stress**
4. **Physical fitness Index**

To test the hypothesis statistically deviation score method of computation of co-efficient of correlation was used. The decision about the significance was taken by comparing the calculated value of the r with the table value at 5% and 1% level of significance.

The result of the study showed that there was a significant relationship between weight of nurses and heart rate while lifting patient from lying to sitting on a bed; between height of nurses and wardboys and heart rate and between weight of nurses while making bed with patient in it; between BMI of nurses and heart rate while dressing patient in bed (table 4.9.5). The significant relationship was also found between age of nurses and wardboys and heart rate while making bed and between weight of wardboys and BMI of nurses while moving furniture. There was no significant relationship between heart rate of selected HCWs while performing other patient handling tasks and non patient handling tasks and age, height, weight and BMI.

The results showed significant relationship between BMI of nurses and wardboys and energy expenditure while dressing of patient on bed; between age and height of Nurses and wardboys and energy expenditure while making bed and weight of nurses and energy expenditure while moving furniture. No significant relationship found between energy expenditure while performing other patient handling tasks and non-patient handling tasks and age, height, weight and BMI.

There was a significant relationship found between age and postural stress while lifting patient from lying to sitting on bed, bed making with patient in it, bed

making, pulling equipment and moving furniture; between height and postural stress while lifting patient from lying to sitting on bed, bed making

Table: - 4.9.5 Coefficient of Correlation showing relationship between selected worker related variables and physiological cost of work in terms

S.no	Variables	Age r-value		Height r-value		Weight r-value		BMI r =value	
		N	W	N	W	N	W	N	W
1	**Heart rate**								
A	**Patient handling tasks**								
1	Lifting a patient from lying to sitting on a bed	0.10	0.08	0.17	0.002	0.60*	0.20	0.20	0.31
2	Making abed with patient in it	0.28	0.50	0.81*	0.85*	0.01	0.68*	0.17	0.35
3	Dressing in bed	0.12	0.08	0.26	0.01	0.56	0.01	0.62*	0.11
B	**Non patient handling tasks**								
1	Bed making	0.86*	0.68	0.01	0.08	0.15	0.36	0.33	0.08
2	Pulling equipment	0.45	0.01	0.35	0.06	0.21	0.18	0.28	0.15
3	Moving furniture (Chair)	0.33	0.30	0.07	0.10	0.45	0.92*	0.88*	0.86*
2	**Energy expenditure**								
A	**Patient handling tasks**								
1	Lifting a patient from lying to sitting	0.41	0.01	0.10	0.10	0.02	0.01	0.02	0.40

S.no	Variables		Age r-value		Height r-value		Weight r-value		BMI r =value
		N	W	N	W	N	W	N	W
2	Making abed with patient in it	0.20	0.08	0.08	0.06	0.002	0.01	0.16	0.12
3	Dressing in bed	0.45	0.10	0.001	0.01	0.20	0.13	0.52	0.82*
B	**Non patient handling tasks**								
1	Bed making	0.92*	0.95*	0.91*	0.88*	0.00	0.01	0.02	0.03
2	Pulling equipment	0.01	0.45	0.10	0.20	0.05	0.08	0.15	0.17
3	Moving furniture (Chair)	0.28	0.49	0.12	0.45	0.88*	0.45	0.28	0.68*
3	**Postural stress**								
A	**Patient handling tasks**								
1	Lifting a patient from lying to sitting on a bed	0.85*	0.87*	0.85*	0.80*	0.89*	0.90*	0.25	0.80*
2	Making abed with patient in it	0.95*	0.82*	0.81*	0.92*	0.81*	0.86*	0.91*	0.80*
3	Dressing in bed	0.20	0.31	0.05	0.17	0.12	0.45	0.92*	0.45
B	**Non patient handling tasks**								
1	Bed making	0.92*	0.97*	0.82*	0.59	0.97*	0.92*	0.95*	0.82*
2	Pulling equipment	0.83*	0.62*	0.93*	0.80*	0.91*	0.72*	0.25	0.18
3	Moving furniture (Chair)	0.81*	0.88*	0.45	0.10	0.25	0.98*	0.90*	0.92*
4	**Physical fitness index**	0.80*	0.97*	0.81*	0.82*	0.18	0.28	0.72	0.42

*Significant at 5% and 1% level of significance

wardboys and heart rate while making bed , pulling equipment; between age , height, weight and BMI of nurses and wardboys while lifting patient from lying to sitting on bed, making bed with patient in it. Hence, the hypothesis was partially rejected. It means that there was partial relationship found between age, height, weight and B.M.I. and heart rate, energy expenditure, postural stress and physical fitness index while performing certain patient handling tasks and non-patient handling tasks. Thus it could be concluded that where there is significant relationship found while performing certain patient handling task like lifting patient from lying to sitting on bed, bed making with patient in it etc and non-patient handling task i.e. bed making, moving furniture etc, the worker related variables increased the heart rate, energy expenditure, postural stress and physical fitness index of selected HCWs.

There was significant relationship between age of nurses, years of working, marital status , working hours , BMI, working schedule of nurses and wardboys and burnout, work stress and job satisfaction. There was partial relationship between age, height, weight and BMI of nurses and wardboys with heart rate, energy expenditure and postural stress and physical fitness index while performing selected patient handling tasks and non patient handling tasks.

Section X

Guidelines for reducing occupational health hazards

The measures to be taken to prevent an occupational health hazards are as follows:

1. For health care workers:

- Wear shoes designed for HCWs, with non-slip soles.
- Handle sharp objects with extreme care; use safety receptacles to store; used hypodermic needles until disposed.
- Keep the sharp disposal containers in close proximity to areas where sharps may be found and discard contaminated needles and other sharp instruments immediately or as soon as feasible after use in to appropriate containers.
- Wash hands and other exposed skin surfaces after coming into contact with blood or body fluids.
- Install ground fault circuit interrupters; call a qualified electrician to test and repair faulty or suspect equipment.
- Health care workers s who were sensitive to natural rubber latex must use non-latex or power- free latex gloves and avoid contact with other latex products.
- Routinely use barriers such as gloves, eye protection and gowns.

- Follow established appropriate infection control precautions assuming blood, body fluids and tissue are infectious.

- Lift items close to the body; avoid awkward posture such as twisting while lifting; avoid lifting/reaching or working above shoulder level

- Use lifting aids for the lifting and transport of heavy patients.

- As the causes of stress are often multi factorial efforts should be made to reduce stress may be of limited stress.

- Be alert for potential violence from patients as well as from physicians and suspicious behavior and repot it.

- During patient handling, use your leg and hip muscles and knee joint to lift.
- When lifting a patient or object, tighten your abdominal and pelvic muscles and keep the patient or object close to your body to prevent injury.

- Avoid reaching over your head to lift to prevent strain or joints located along your spine.
- Follow the general lifting guidelines recommended by the NIOSH (National Institute of Occupational Safety and Health) which states, that the most a person can lift with minimal risk of injury under ideal conditions is 23 kg or 51 pounds. For weights above the ideal use mechanical aid.

Ways to reduce injury risks:

There are several ways that health acre workers can reduce injury risks. These include:

- **Using lifting assistance device:** a variety of devices are available to help is lift and move patients from bed to seat such as: gait belt, walkers, rails, hoyers lifts, sliding boards, draw/lift sheets.

- **Using appropriate equipment:** there is a choice of powered equipment available to reduce patient handling activities such as powered aids to change a patients posture, height adjustable chairs and powered wheel chairs.
- **Use appropriate beds**: The height of the bed determines how much bending and reaching a HCW has to do. HCWs are of different heights, so a simple to operate, height adjustable bed is important to allow bed height to be approximately adjusted to HCWs.

- **Use back belts:** The use of back belts significantly reduced injury risks.

2. For employers:

- **Provide regular equipment maintenance procedure training for HCWs:** Equipment must be kept in good working order.

- **Provide ergonomic design of work places**: use architectural and design features such as rails or ramps for patients to minimize awkward movements.

- **Providing better ergonomics training**: train HCWs regarding good work postures and ways of minimizing twisting, bending and/or lifting

items from the floor. Also train them in safe lifting practices and in the correct use of appropriate equipment. Provide ways of refreshing and reinforcing the training.

- **Provide adequate staff**: Injury risks can be reduced by increasing the number of people available to assist with lifting or treating patients i.e. HCWs.

- Comply with all safety instructions regarding the installation and periodic inspection of electrical medical equipment.

Recommended heights of hospital furniture

S.No	Hospital Furniture	Recommended heights			
		Nurses		Wardboys	
		Min. (cms)	Max. (cms)	Min. (cms)	Max. (cms)
1	Bed	83-88	92.5-97.5	91-96	100-105
2	Bed side lockers	83-88	92.5-97.5	91-96	100-105
3	Drug trolley	83-88	92.5-97.5	91-96	100-105
4	Operation table	95.5	105	103.5	112.5
5	Stretcher with stand	95.5	105	103.5	112.5