International Journal of
Advances in Scientific Research and Engineering (ijasre)

E-ISSN : 2454-8006

DOI: http://dx.doi.org/10.7324/IJASRE.2018.32613

Volume 4, Issue 2
February-2018

Evaluation of Computer Workstation Ergonomics at Ernakulam, Kerala: A Case Study

Varsha N S[1] and Pradeep Kumar P[2]

[1]M.Tech scholar and [2]Associate Professor

[1]Industrial Engineering and Management

[2]Department of Mechanical Engineering

Rajiv Gandhi Institute of Technology

Kottayam, Kerala

India

ABSTRACT

Computers and computer workstations are an integral part of our daily life. People spend more time in front of computer workstations. These life smoothening technology can affect our health in a bad way. This is mainly due to the improper and discomfort sitting position. Neck, shoulders, lower back, arms, writs, legs etc are affected by improper sitting positions. This will vary according to the time they spend in front of the workstation. In this paper, we were studied about the problems and discomfort level in a computer workplace situated in Kerala. A survey was conducted and the results were shocking.

Key Words: *Computer workstation, Ergonomics, Improper sitting position, Ergonomic Study*

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1. INTRODUCTION

Nowadays, it is practically impossible to find an office without a computer workstation. We use computers to do almost every kind of work in our companies and industries, as well as in our homes. Millions of people works with computer every day. The need to use computers increases as computer technology advances and the development of software's. this can lead to occupational health and safety problems. As a result, reduced performance and dissatisfaction may occure. The computer chair and desk are the two most important parts after the computer itself. since we have become a society that sits for a greater proportion of the day, our office chair is an important component in determining our overall comfort and health. So, these should provide comfort, since discomfort can negatively affect overall health and productivity, especially for people who work very long hours each day.

An uncomfortable computer workplace can create problems with regard to health and productivity. Improper sitting position for long periods create pain around neck, shoulders, lower back, arms, wrists, legs and other parts of the body. This will vary according to the time they spend in front of the computer workstation.

2. STATEMENT OF PROBLEM

An ergonomic study of a computer workstation is always interesting .In developing countries, the number of computer centers are more. So we picked on of these computer centers called " Think Force Computer Solutions" situated in the mainland portion of the city Ernakulam in center Kerala, India. They are the leading and globally accepted IT providers in Kerala. Since it is a perfect choice to conduct our study, we selected Think Force as our sample. The objective of this work is to study and identify ergonomic deficiencies in computer workstations and suggest strategies to reduce or eliminate these deficiencies to improve occupational health and safety, and employee performance and satisfaction.

3. METHODOLOGY

Ergonomics is the science and technology of fitting the activities and environment to the abilities, dimensions, and needs of people to improve performance to ensure comfort and health and safety . by applying the principles of ergonomics the efficiency of human–computer interaction, comfort, health, and the user's safety can be improved. Eason K.D developed a classical ergonomic framework and identified factors that affect human performance. These factors include task characteristics, user issues, environmental factors, and human–computer interaction etc. The elements of a work system are: the worker, equipment, environment, task, and organization interact when work is performed.

The methodology of this work pursued in identifying ergonomic deficiencies in computer workstations involved a physical measurement of the relevant dimensions of workstations. This was achieved by using a checklist to collect employee information and a questionnaire on employee perception on various work attributes. This included the duration of work hours, break time, experiencing difficulties, intensity of pain, major body parts that are affected. The questionnaire contained three parts: personnel information's, workstation and work environment and employee health information. In the last section, the employees are asked to rate the pain causing in their various body parts on a scale of 1 to 5. The scale varied from " slight discomfort", "discomfort", " moderate", "pain" and "significant pain".

3.1 PARTICIPANTS INFORMATION

The participants had mean experience of 5 years on similar job. The group consist of 40% female and 60 % male. Their education ranged from diploma to bachelor degree. Employee characteristic and computer usage is tabulated below:

TABLE 1. Employee Characteristics (*n* = 40)

Characteristics	*M*	*SD*	Min–Max
Age (years)	42	8.29	26–55
Weight (kg)	74	20.69	45–105
Height (mm)	1680	11.77	1500–1850

TABLE 2. Computer Usage Statistics

	Employees at a Computer (%)	
Duration	Per One Sitting	Per Day
1–2 hrs	60.0	0
2–4 hrs	17.5	10
>4 hrs	22.5	90
Total	100.0	100

Eighty percent of the employees in the office used a computer table, while others used a normal office table for the computer. While 60% used a fully adjustable chair (i.e., height, backrest, and arm rest could be adjusted), 40% used a semi adjustable chair (only the height could be adjusted). With a fixed table height (work height) and a semi adjustable chair, workstation adjustment was difficult. sixty percent reported that they maintained a supported and straight back, while 40% reported a bent and unsupported back.

4. RESULTS AND DISCUSSION

Musculoskeletal problems, such as back, shoulder, neck, wrists and arm pain, were significant indicating effects of ergonomic deficiencies in the workstation system. It was evident from the results that some employees were using office tables for their computers, office chairs, and semi adjustable chairs

The results obtained from the survey are graphically presented below.

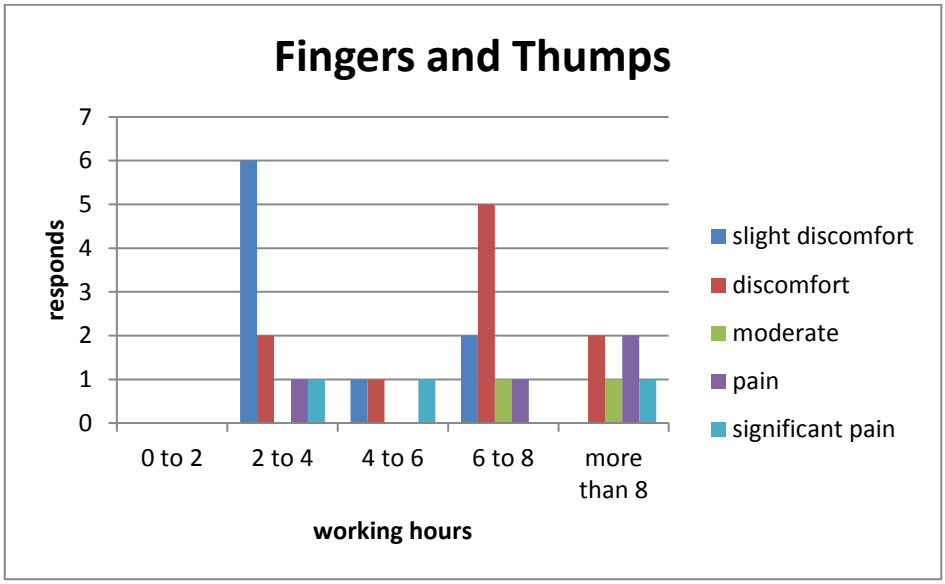

Figure 1: Graphical analysis of survey result- fingers and thumps

Fingers and thumps show discomfort and pain as the working hour's increases which is depicted in figure 1.

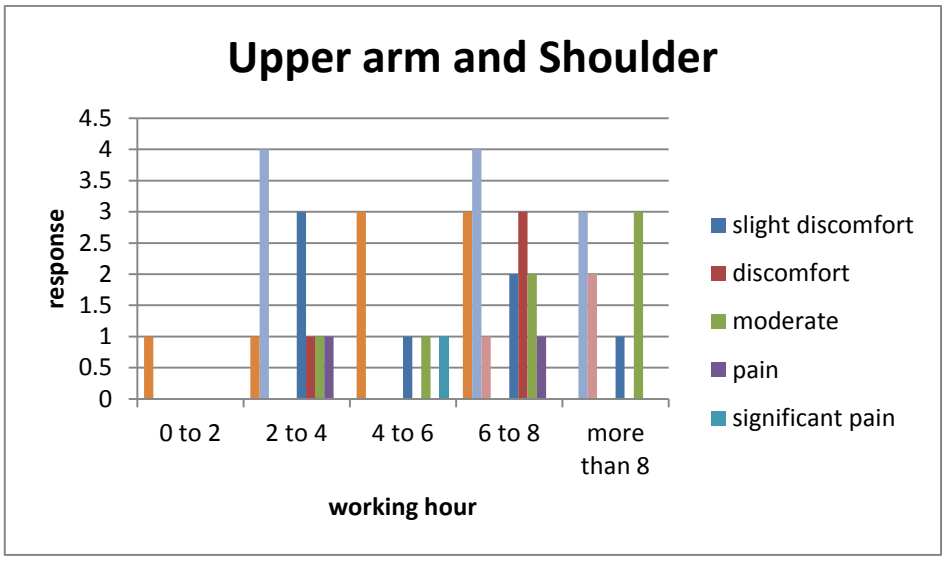

Figure2: Graphical analysis of survey result- upper arm and shoulder

As the working hours goes on increasing, workers are feeling significant pain in their upper arm and shoulders which is depicted in figure 2.

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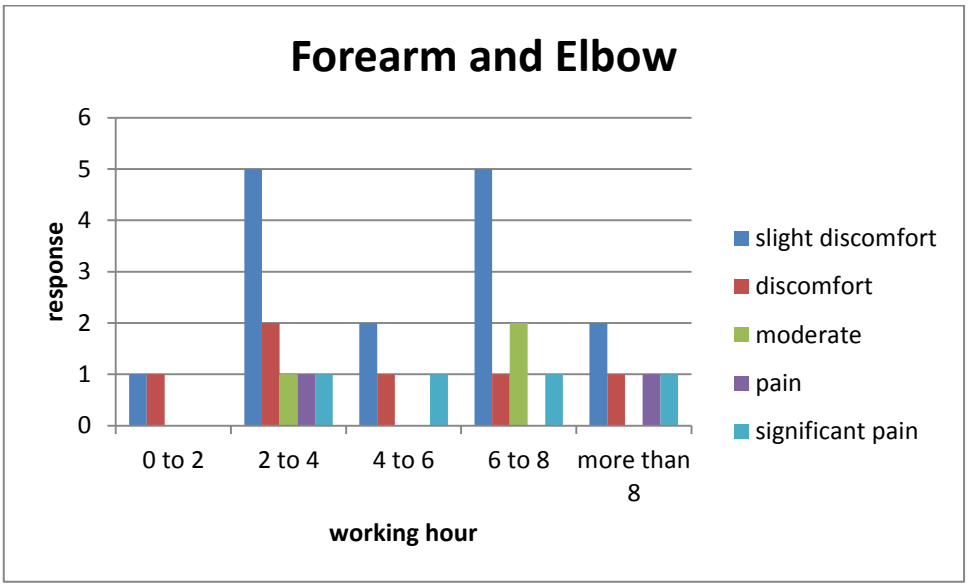

Figure 3: Graphical analysis of survey result-forearm and elbow

There was a slight discomfort in forearm and elbow of workers, even they had used the workstation for zero to two hours which is depicted in figure 3.

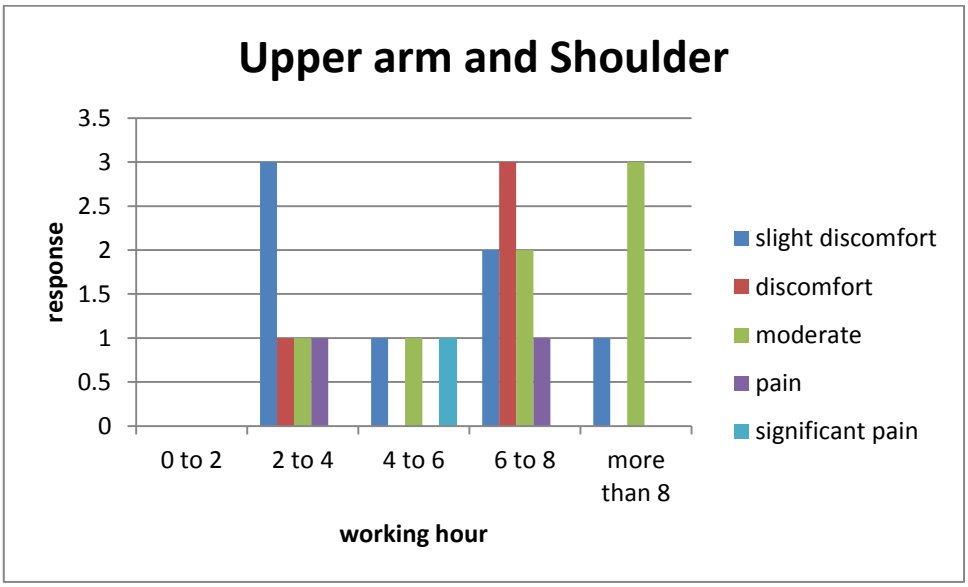

Figure 4 : Graphical analysis of survey result- upper arm and shoulder

When the computer usage goes beyond 8hours, there was moderate pain in the upper arm and shoulder of the computer users which is depicted in figure 4.

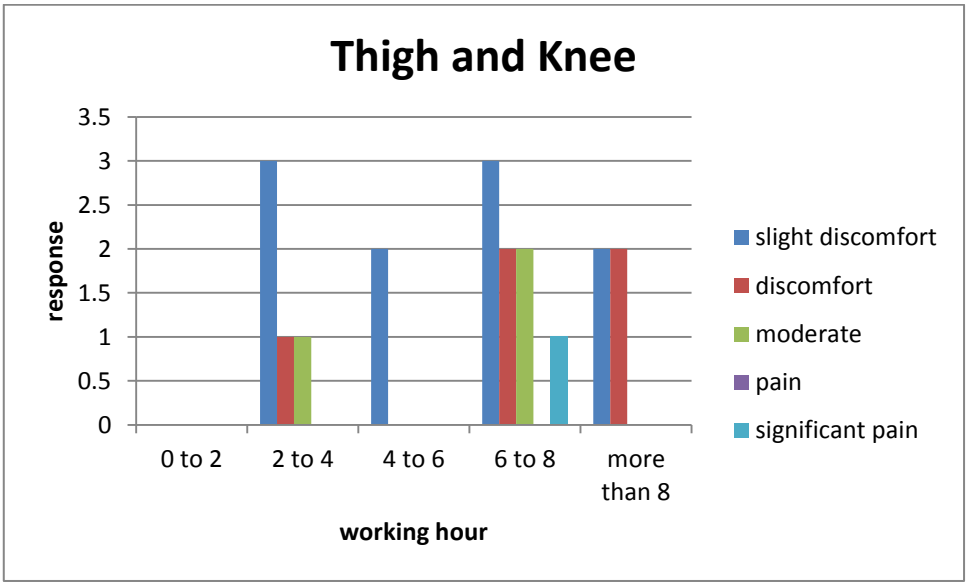

Figure 5: Graphical analysis of survey result-thigh and knee

Thigh and knee does not show any significant problem while the survey was conducted. They were affected only if the working hour goes above 4 to 6 hours which is depicted in figure 5.

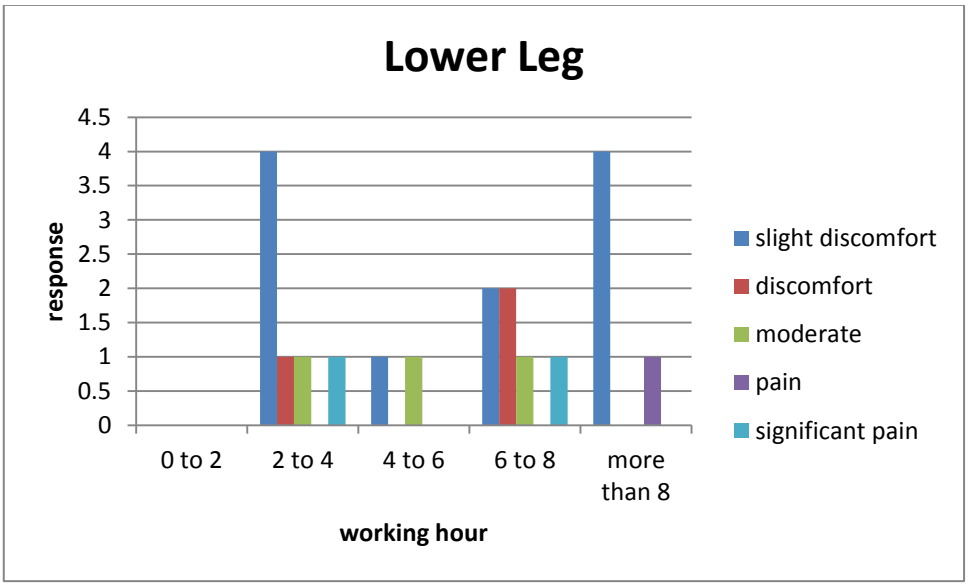

Figure 6: Graphical analysis of survey result- lower leg

Lower legs were affected in a small percentage of people. A few were experienced pain when the working hours were above 8 hours which is depicted in figure 6.

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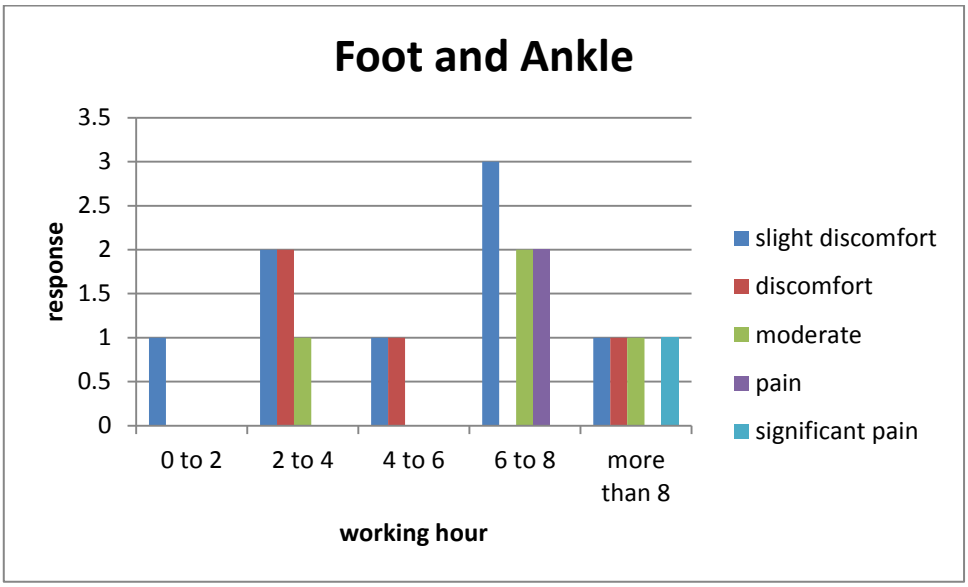

Figure 7: Graphical analysis of survey result-foot and ankle

When the working hour goes above 8 continuous hours, the foot and ankle of the computer users were affected. Some of them had experienced significant pain which is depicted in figure7.

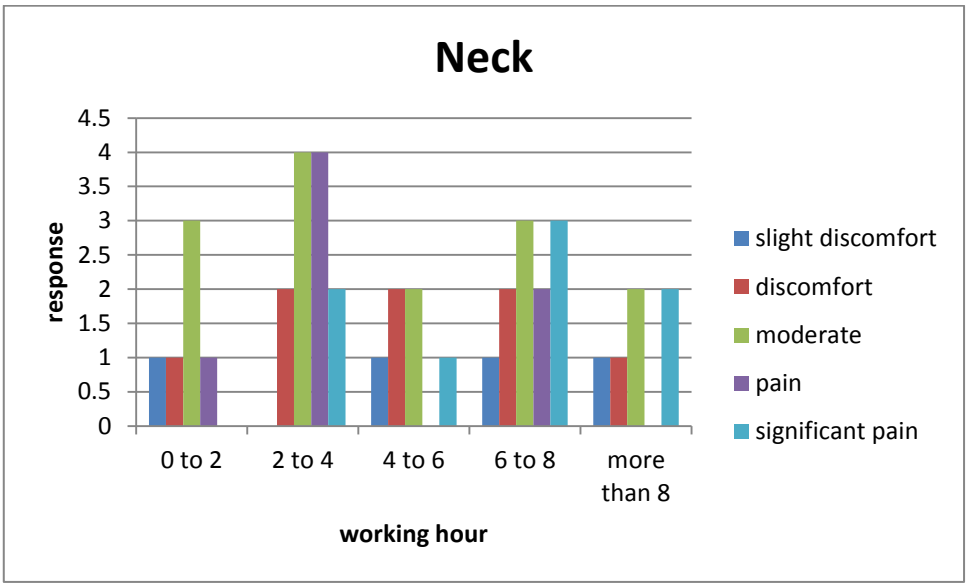

Figure 8: graphical analysis of survey result-neck

Neck was one of the parts of body which is badly affecting by the wrong sitting postures of computer users. There was strain in neck even the working hour more than 1 to 2 hours which is depicted in figure 8.

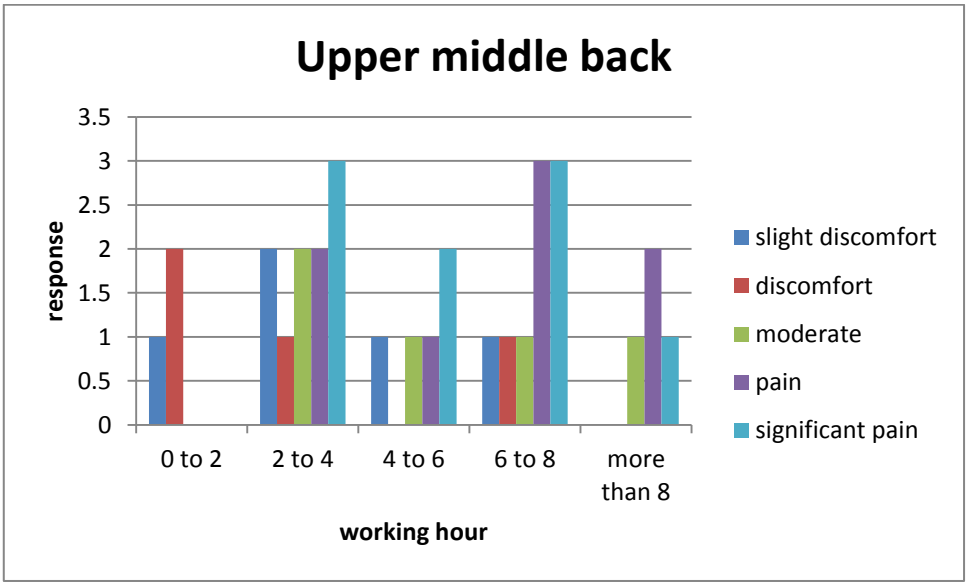

Figure 9: Graphical analysis of survey result-upper middle back

Another part of body which is badly affecting by the wrong sitting posture is upper middle back. There is significant pain when the working hour crosses 2 hours which is depicted in figure 9.

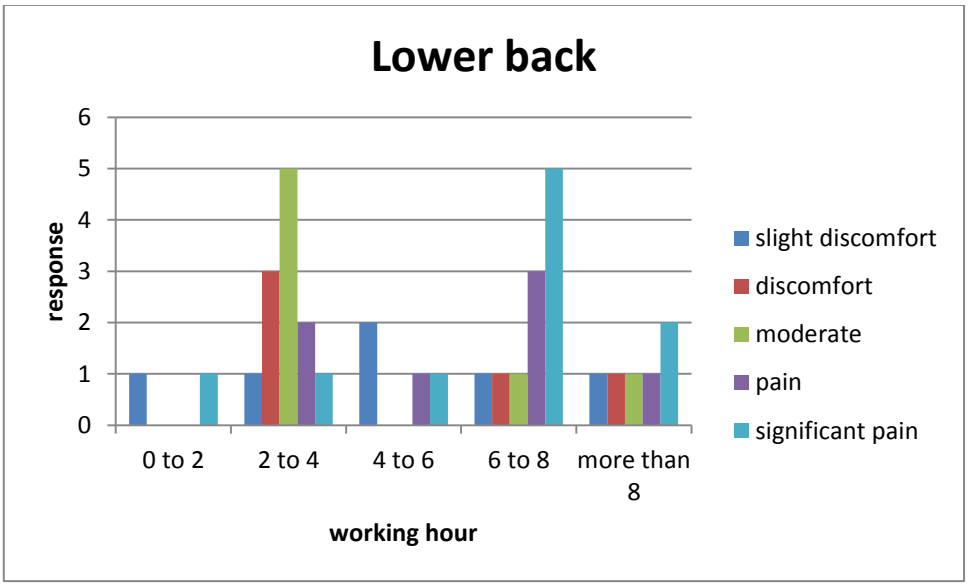

Figure10: Graphical analysis of survey result- lower back

Lower back of computer users also affected by the sitting postures. There is discomfort, pain and significant pain in lower back when working hour increases above 2 hour which is depicted in figure 10.

Most employees did not have document holders that are important for minimizing back and neck bending, especially for those who spend a lot of time on data entry in the office. They were not using wrist rests, either.

These conditions, coupled with long hours of computer usage, could cause body discomfort and musculoskeletal problems. Maintaining a correct posture at work eliminates unnecessary stress on body parts; hence it reduces musculoskeletal disorders. Although it is recommended that a short break must be taken every 2 hrs of computer use, most employees spent over 4 hrs a day without proper rest breaks due to the work pressure. This obviously contributed to health problems as employees continued to be in a fixed posture for prolonged periods.

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5. CONCLUSIONS AND RECOMMENDATIONS

5.1. CONCLUSIONS

Based on the results of this study, the following conclusions could be drawn on the ergonomic deficiencies of computer workstation:

- Ergonomic difficulties were significant in physical design, component layout, employee postures, work practices, and training in office computer workstations.
- There was a positive and important correlation between worker health symptoms and workstation facilities. That is, poor workstation facilities contributed to more health problems.
- Computer workstation facilities and furniture were improper for the workers to perform their job, which may have contributed to ergonomic deficiencies in terms of layout and workstation organization.

5.2. RECOMMENDATIONS

The following recommendations were made in order to rectify the ergonomic deficiencies identified for computer workstations in the office environment:

- Computer workstations in offices should be arranged by following ergonomics standards, guidelines, and recommendations.
- Employees must adopt a natural posture with back support and follow recommended guidelines in computer workstation usage and there should given proper awareness about the correct postures.
- Workstation components should be provided in order to better maintain and follow ergonomics standards.

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