*RESEARCH ARTICLE*



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# Study of Level of Understanding about the Ergonomics to be Followed in the Rural and Urban Population on Prevention of Various Musculoskeletal Problems

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## Abstract

**Background:** Ergonomics is a vague concept to learn and applying it to day-to-day life will make the work easier with less effort. Urban and rural populations both have different types of work strategies. By understanding ergonomics, modifications will be made, preventing musculoskeletal problems. This research aims to study the level of understanding of the ergonomics to be followed in rural and urban populations for the prevention of various musculoskeletal problems. **Objectives:** The objectives are to check the awareness level related to ergonomics among rural and urban populations using a self-made questionnaire and find out the common musculoskeletal problems prevailing and possible risk factors related to them. **Methods:** This was a convenience sampling method that consisted of 91 participants included in this study. 45 from rural and 46 from urban populations were selected based on inclusion and exclusion criteria. The questionnaire was made on the basis of different aspects, which will determine the level of understanding overall. The questionnaire was provided online and in offline mode too. The level of understanding was checked for each population based on responses. **Results:** Based on the statistical analysis, it was found that the urban population has a higher level of understanding and prevention strategies as compared to the rural population. **Conclusion:** Findings showed that ergonomics was a new term for the participants, but knowledge and understanding were seen more in urban participants than rural participants.

**Keywords:** Ergonomics, Musculoskeletal Disorders, Quality of Life

## 1. Introduction

Ergonomics is a science in connection with the fit between people and their work environment[1]. It mainly focuses on making sure that the tasks, equipment, information and environment suit each other and can coordinate with each other[1]. According to some research papers, as ergonomics is a very broad and new term for rural areas, the awareness level of this concept among people is very low[1]. While performing daily activities, everyone should follow some proper manners that are according to ergonomics standards[1]. Understanding ergonomics is necessary to be able to make the workplace and the workers work in harmony with each other[1].

Ergonomics may work on some basic principles such as keeping everything in easy reach, working at proper heights, reducing excessive forces, working in good postures, reducing excessive repetition, minimizing

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fatigue, minimizing direct pressure, providing adjustability and change of posture, providing clearance and access, maintaining a comfortable environment, enhance clarity and understanding and improve work organization.

Ergonomics is a term that is often used in community health. It plays an important role in preventing problems, which are often observed in the difficulties that are often noticed in urban and rural populations. Ergonomics works in various aspects, for example in urban workplaces, offices, schools and stadiums to reduce the risk of musculoskeletal injuries. In rural areas, it plays an important role in farming. Ergonomics considers proper tool and equipment use in addition to workstation design and posture. Tools and implements with ergonomic designs can lower the amount of force needed to complete activities, reducing the risk of repetitive stress injuries.

Ergonomics plays an important role in improving the quality of life. Further, it plays a very important role in improving an individual's health and preventing musculoskeletal problems. By using ergonomics in day-to-day life and making modifications in the workplace as well as at home, you make the task easier. By applying proper ergonomics in work life, we reduce the risk of having musculoskeletal problems. The quality of life depends on the individual's health and pattern of work. Ergonomics helps improve these bodily factors which directly impact one's life.

In rural and urban populations, improving lifestyle is achieved only if there is an awareness about ergonomics. It helps to know that ergonomics plays a vital role in the prevention of musculoskeletal problems. Lifestyle modification should be done at home and work according to ergonomics to prevent musculoskeletal problems. Making work easier and lifestyles more convenient is possible if ergonomics is considered. Many agricultural activities require excessive amounts of human power and are associated with musculoskeletal disorders.

The solutions to ergonomic problems can be greatly improved by engineers, doctors, and therapists using effective problem-solving analysis and synthesis methodologies[2]. Corporate offices, office buildings and factories are starting to reach out to healthcare experts and qualified ergonomists with experience when they need assistance in making decisions[2]. The key principles of ergonomics are sound work analysis and problem-solving, both of which require experience in addition to education to be most effective[2]. In the multifaceted and intricate subject of ergonomics, acknowledging the advantages of several disciplines is crucial[2]. Solving problems together is frequently the most successful method[2].

Musculoskeletal problems are seen in both populations. Because of repeating the same way of working, work-related musculoskeletal problems can occur. Interventions can be done in various ways, i.e., by medication and physiotherapy. But to prevent the recurrence of the same, it can be done through ergonomic application. People are not aware of this term, but it's the need of society to work and modify themselves to improve the standard of life. Work-related musculoskeletal problems are quite common[3]. Their impact in terms of pain and disruption of normal health is seen in farming and other professions[3]. Prevention can be achieved through early diagnosis[3].

MSD (Musculoskeletal) Disorders are commonly seen in every age group these days. To control its intensity and reduce recurrences, some measures have to be taken. Being mentally as well as physically fit is one of them, but the most important thing is to keep the workplace within easy reach. Most people spend their major time at their work offices in urban areas and on farms in rural areas. Making the modifications at their respective places will help them become fitter. Ergonomics maintains the balance between people and their workplace, so making changes according to that will have a beneficial effect.

Postural workload and uncomfortable positions like bent or twisted postures are the main causes of musculoskeletal pain, which may be reduced by following proper ergonomics[4]. Agricultural mechanization is done according to ergonomic evaluation to maintain occupational safety and health[4]. As a result of the vigorous activity, farmers are prone to musculoskeletal conditions such as hand-arm vibration syndrome, neck and upper limb symptoms, low back pain and osteoarthritis of the hip and knee[5].

While performing tasks, keeping a neutral body posture where joints are aligned and not overly bent or extended reduces the burden on muscles and aids in preventing strain. It is recommended to take regular breaks and do stretching exercises to keep your muscles flexible and loose. Ergonomics considers proper tool and equipment use in addition to workstation design and posture[6]. Ergonomics experts build or enhance work environments, tools and processes for employees to guarantee the efficient, safe, and effective attainment of individual and group objectives[6].

Ergonomics may work on reducing the occurrence of musculoskeletal problems, which can be achieved by addressing the main problems resulting from poor posture, repetitive motion and uncomfortable positioning. Ergonomics is the science of the relationship between the workplace and the needs of the human body. By applying ergonomic intervention while designing furniture, tools and appliances there are chances of reducing physical strains, which may lead to Musculoskeletal (MSK) problems. Furthermore, ergonomic rules support good posture and proper body alignment to make the environment suitable and reliable for an individual. This approach greatly lowers the risk of pain and discomfort in the neck, spine and limbs.

By employing techniques to reduce repetitive movements and provide proper support for frequently used body parts, ergonomics also tackles problems caused by repetitive strain. Most importantly, ergonomics education and training programs enable people to know how to set up their workstations for optimal health. Having a proper understanding of ergonomics will help rural as well as urban people to make their workplaces more proper and efficient. By increasing people's knowledge of ergonomic concepts and advantages, we can enable them better to spot and eliminate any ergonomic risks in their surroundings.

Overall, ergonomics is a proactive strategy for protecting an individual's health. It helps prevent musculoskeletal issues, boosts productivity and promotes a healthier, more comfortable work environment by taking into account the human aspect in the design of workspaces and gadgets. Applying ergonomics concepts at work is an appropriate investment in the well-being of employees and the success of an organization.

While considering rural and urban aspects, a variety of work is taking place. People have a diverse variety of workplaces and skills. As the work type increases, the risk of musculoskeletal injuries also increases. An individual needs to understand how ergonomics works. Knowing the importance and techniques of ergonomics will make it easier for an individual to build the workplace.

Furthermore, the incorporation of ergonomic considerations in daily life, such as the ability to modify houses or workplaces and provide accessible public spaces enhances the mobility and accessibility of people with diverse abilities, thereby contributing to an improved quality of life. Adopting ergonomic principles is beyond just creating things to work; it also creates a positive link between people and their surroundings, making life better by promoting efficiency, comfort and life in all aspects of daily life.

There are several advantages to implementing ergonomics in the workplace but the two main ones are injury prevention and general well-being. Employers can dramatically lower their workers' risk of MSDs by emphasizing ergonomic procedures. Adjustable seats, ergonomic workstations and appropriate desk arrangements help people maintain good posture which lessens physical strain on the body and lowers the risk of problems. Another notable benefit of ergonomic treatments is increased productivity. Employees can focus more intently and efficiently on how they worked during that time at ease and not experiencing physical discomfort. Individuals can move around in well-designed workstations which encourage blood circulation, reduce weariness and sustain better levels of productivity throughout the day.

The medical field is challenging as it requires long hours, drawn-out procedures and continuous posture[7]. Healthcare Providers (HCPs) frequently experience musculoskeletal problems[7]. The most frequently reported musculoskeletal conditions include chronic pain disorders, nerve injuries, repetitive strain diseases, and discomfort in the neck, back, shoulders, elbows, and wrists[7]. The science of ergonomics is the adaptation of people, tools, and jobs to each other for maximum productivity and safety[7]. Musculoskeletal diseases will arise from an ergonomically inappropriate workplace for a health care provider[7]. Prolonged postures, repetitive jobs, intense hand exertions, equipment use and precise requirements are the key ergonomic problems[7].

Ignoring ergonomic aspects at work can lead to a variety of disorders and issues, including musculoskeletal disorders that are tied to the job for employees[8]. MSDs are the second most common disorder in the workplace in terms of severity and prevalence after respiratory diseases[8]. According to ergonomic principles, a worker's posture and movement can provide vital information about their risk of developing musculoskeletal problems at work[8].

Disorders of the upper extremities, shoulder and low back are common among farmers and farm workers[9]. The frequency of problems associated with the upper and lower extremities was considerably decreased after implementing ergonomics ideas[10].

To understand the relationship between ergonomic advice and the prevention of musculoskeletal problems, it is important to consider some aspects like home modifications, repeated activity effects while working, transportation systems, work patterns, social requirements and a suitable people-work balance. It is a necessity for society. By creating awareness about ergonomics among people, it makes their lives easier. It's not a very big change but a lifelong interventional method which needs to be followed. Home and workplace modifications based on ergonomics can avoid long-term problems. Early prevention is always a better treatment.

## 2. Materials and Method

The study was approved by the Ethical Committee and Protocol Committee (protocol no.603/2022-2023). Ninety-one participants were chosen using the formula of $n=Z^2pq/L^2$ for the observational study using a survey approach via questionnaires[11]. The purpose of the study was to evaluate how well urban and rural communities understood musculoskeletal concerns and ergonomics. Individual questions were asked of each participant and a self-made questionnaire was used to assess their comprehension. For documentation purposes, a case sheet with the names, ages, genders and email addresses of the participants was made. A convenience sampling method was used in the Satara district. The inclusion criteria include both male and female participants between the ages of 25 and 65 in rural as well as urban populations. People with cognitive mental disorders or disabilities were among the exclusion criteria.

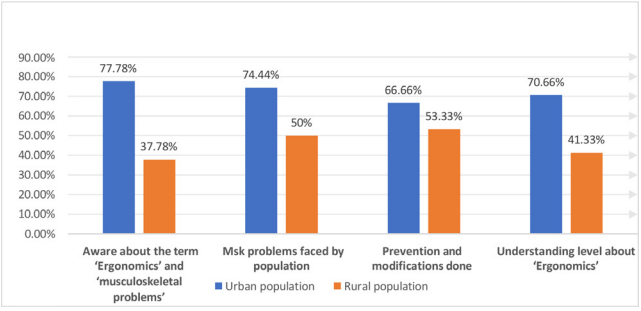


**Figure 1.** Mean percentage knowledge score of category-wise understanding level about ergonomics among the urban and rural population.

## 3. Result

The survey aimed to determine the degree of understanding related to ergonomics that both urban and rural populations must adhere to in order to avoid musculoskeletal issues. The purpose of the questionnaire was to ascertain the degree of information about ergonomics that both urban and rural populations should be aware of to avoid musculoskeletal issues.

A self-made questionnaire was made, which includes 13 questions based on understanding terms, prevention strategies, modifications done and facility availability. The response was taken by sending the Google forms as well as in offline mode. The respondents were aged between 25 and 65 years old, from both populations. 13 questions were selected for the data analysis. The collected data was analyzed by a statistician using an instant application of skeletal problems.

To assess rural and urban population's knowledge of ergonomics.

The questionnaire was provided, including 16 questions in which categories were made according to question types. In the age group between 25 and 65, the total responses to this question were 91, which is 45 from rural areas and 46 from urban areas.

Table 1 and Figure 1 depict that in the first category, awareness about ergonomics and MSK terms was checked by asking two questions and out of those, 77.78% of the urban population and 37.78% of the rural population learned about it. Two investigations were made in the next category to determine the number of individuals who have faced MSK problems, and out of those, 74.44% of the urban population and 50% of the rural population responded yes. In the third category, 5 questions were

**Table 1.** Percentage distribution of category-wise understanding among urban and rural population

| | Aware About the Term 'Ergonomics' and 'Musculoskeletal Problems' | MSK Problems Faced by the Population | Prevention and Modifications Done | Understanding Level of 'Ergonomics' |
|---|---|---|---|---|
| **Urban Population** | 77.78% | 74.44% | 66.66% | 70.66% |
| **Rural 45 Population** | 37.78% | 50% | 53.33% | 41.33% |

asked to check what prevention has been done to overcome MSK problems and out of those, 66.66% of the urban population and 53.33% of the rural population have made some modifications. In the fourth category, 5 questions were asked to check the understanding level of ergonomics and out of those, 70.66% of the urban population and 41.33% of the rural population responded yes.

The questionnaire was provided, including 16 questions. In the age group between 25 and 65, the total responses to this were 45 from rural areas.

Table 2 and Figure 2 indicate the understanding which was checked based on average, good and excellent categories. 17 individuals had average understanding, 26 individuals had good understanding and 2 individuals had excellent understanding, i.e., 37.77%, 57.77% and 4.44%, respectively.

The questionnaire was provided, including 16 questions. In the age group between 25 and 65, the total responses to this were 46 from urban areas.

Table 3 and Figure 3 show the understanding which was checked based on the average, good, and excellent categories. 0 individuals had average understanding, 34 individuals had good understanding, and 12 individuals had excellent understanding, i.e., 0%, 73.91%, and 26.88%, respectively.

**Table 2.** Frequency and understanding percentage of ergonomics among the rural population

| Rural | Frequency | Understanding |
|---|---|---|
| **Average** | 17 | 37.77% |
| **Good** | 26 | 57.77% |
| **Excellent** | 2 | 4.44% |

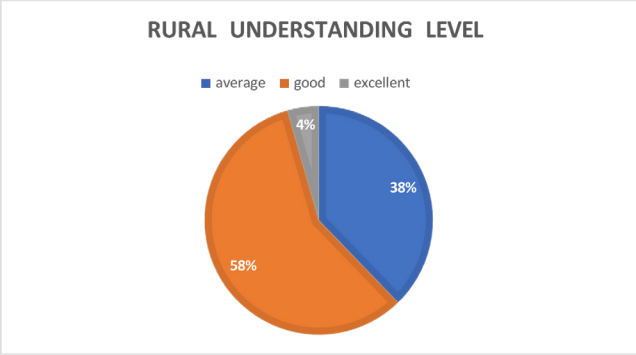


**Figure 2.** Mean percentage about the understanding level of ergonomics in rural population.

**Table 3.** Frequency and understanding percentage of ergonomics among the urban population

| Urban | Frequency | Understanding |
|---|---|---|
| **Average** | 0 | 0% |
| **Good** | 34 | 73.91% |
| **Excellent** | 12 | 26.88 |

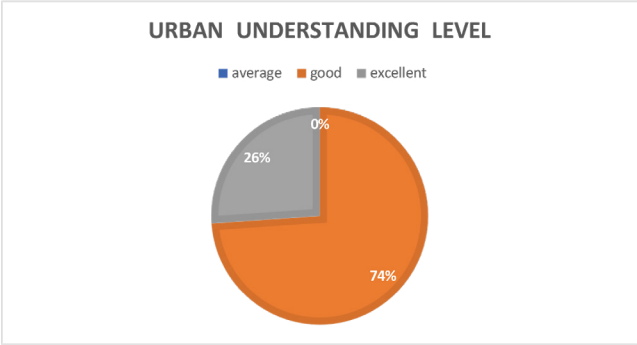


**Figure 3.** Mean percentage about the understanding level of ergonomics in urban population.

**Table 4.** Comparison of mean scores and standard deviation between urban and rural populations

| | Rural | Urban |
|---|---|---|
| **Mean** | 6.4889 | 9.7826 |
| **Standard deviation** | 2.273 | 1.725 |

Unpaired test: 7.799 (by comparing both areas) P-Value: <0.0001

The mean, standard deviation, unpaired test, and P value were calculated by a statistician using an Instat application.

## 4. Discussion

Ergonomics plays a very important role in creating a balance between people and their workplace. It includes various components, such as alterations to lifestyle, social changes, workload management and musculoskeletal problem prevention strategies. However, the level of understanding about ergonomics is low among the population. To find out that aspect, this study was done. According to some research and guidelines, there are chances to modify the lifestyle and make it easier which can be done through ergonomics.

In January 1992, Shulenberger CC carried out another randomized study. According to the research, ergonomists

become more productive and efficient as they become more accustomed to the problem-solving process[2]. The answers to ergonomic difficulties can be greatly aided by engineers, doctors and therapists using effective problem-solving analysis and synthesis methodologies[2]. Corporate offices, office buildings and factories are starting to turn to healthcare experts and qualified ergonomists with ergonomic experience when they need assistance making decisions[2].

The purpose of this recent study was to check their understanding of ergonomics among rural and urban populations. 45 participants from rural populations and 46 from urban populations were included in this study. As per inclusion criteria, the 25-65 age range was determined from both populations and questionnaire was provided and responses were collected.

Categories were decided to check the understanding levels. i.e. awareness about the terms 'Ergonomics' and 'Musculoskeletal problems', Musculoskeletal problems faced by the population, prevention and modifications done and understanding of ergonomics. Results showed that in each category urban population has more awareness and level of understanding than the rural. To find out the overall understanding of the individual population, levels were divided as average, good and excellent. Results showed that in the rural population, good and excellent understanding levels were 37.77%, 57.77% and 4.44%, respectively and in the urban population, good and excellent understanding levels were 73.91% and 26.88%, respectively. The urban population has more understanding than the rural population about ergonomics.

The responses were calculated for both urban and rural populations, which they recorded in an Excel sheet. Then the mean values and standard deviation were calculated for both areas with the help of the Instat application. Then, with the help of the unpaired T-test, the P-value has been calculated which turns out to be less than 0.001, i.e., considered extremely significant.

Another study was conducted in January 2018 by Daneshmandi H, Kee D, Kamalinia M, Oliaei M, and Mohammadi H. That research suggested that particular musculoskeletal problems may be associated with specific body parts and occupations[12]. Lower back disorders are frequently associated with lifting and carrying weights[12]. Upper-limb disorders affecting the fingers, hands, wrists, arms, elbows, shoulders and neck might arise from prolonged static force exertion or be exacerbated by it. The intensity of these conditions might range from sporadic pain to chronic illnesses[12]. A painful 10 episode could be the outcome of a transient acute overload or it could be a warning sign of a more serious illness. Certain body parts and vocations may be linked to certain musculoskeletal issues. Lifting and carrying weights is often linked to lower back issues[12].

This research has shown that the ergonomics term is more common in rural areas compared to urban areas. People have less knowledge about ergonomics in both areas, but it is seen more in rural areas. Understanding the term ergonomics and how it will help reduce the risk of developing MSDs will be beneficial for urban and rural areas.

The study was limited by time constraints, a small study group, an unfavourable geographic location and the need for a larger sample size to increase the study's reliability. In the future, people will comprehend ergonomics thoroughly and alter or intervene in their lifestyles as a result. This will aid in their understanding of ergonomics and its applications in daily life. Interventions, such as educational campaigns and training materials are made for the rural population to increase their understanding of ergonomics. To prevent further musculoskeletal problems, ergonomics must be given careful consideration.

## 5. Conclusion

The conclusion from this study is that we have greater numbers of individuals living in cities understanding the term ergonomics than rural populations. As a result, excellent understanding is seen more in urban areas, i.e., 26%, than in rural areas, i.e., 4%. After a comparative study, it was concluded that knowledge, modifications and development have been more concentrated in urban areas than in rural ones. Based on the survey outcomes, both question- and area- specific implications have been generated and cities have shown greater awareness than rural places.

## 6. References

1. Beevis D, Slade IM. Ergonomics-costs and benefits. Applied Ergonomics. 2003; 34(5):413-8. https://doi.org/10.1016/S0003-6870(03)00061-9. PMid:12963327.
2. Shulenberger CC. Ergonomics in the workplace: Evaluating and modifying jobs. Occupational Medicine (Philadelphia, Pa.). 1992; 7(1):105-12.

3. Burton K, Kendall N. Musculoskeletal disorders. BMJ. 2014; 348:g1076. https://doi.org/10.1136/bmj.g1076. PMid:24561301.
4. Hayati A, Marzban A. Ergonomic problems in agricultural farms: Explainable relationship between awkward postures and body discomforts in Iranian leafy vegetable cultivation. Work. 2022; 71(3):709-17. https://doi.org/10.3233/WOR-PMid:35253704.
5. Walker-Bone K, Palmer KT. Musculoskeletal disorders in farmers and farm workers. Occup Med (Lond). 2002; 52(8):441-50. PMID: 12488514. https://doi.org/10.1093/occmed/52.8. 441. PMid:12488514.
6. Berguer R. The application of ergonomics in the work environment of general surgeons. Rev Environ Health. 1997; 12(2):99-106. PMID: 9273926. https://doi.org/10.1515/REVEH.1997.12.2.99. PMid:9273926.
7. Mansoor SN, Al Arabia DH, Rathore FA. Ergonomics and musculoskeletal disorders among health care professionals: Prevention is better than cure. J Pak Med Assoc. 2022; 72(6):1243-5. PMID: 35751350.
8. Alipour P, Daneshmandi H, Fararuei M, Zamanian Z. Ergonomic design of manual assembly workstation using digital human modelling. Annals of global health. 2021; 87(1). https://doi.org/10.5334/aogh.3256. PMid:34221908 PMCid: PMC8231455
9. Davis KG, Kotowski SE. Understanding the ergonomic risk for musculoskeletal disorders in the United States agricultural sector. American journal of industrial medicine. 2007; 50(7):501-11. https://doi.org/10.1002/ajim.20479. PMid:17506508.
10. Bahrami-Ahmadi A, Hoseini HR, Kabir-Mokamelkhah E, Dehghan N, Aghilinejad M. Impact of two ergonomics training on the prevalence of upper and lower extremity complaints among nurses. Journal of Education and Health Promotion. 2021; 10:417
11. Vyas R. Ergonomic assessment of the prevalence of musculoskeletal disorders among Indian agricultural workers. Journal of Ergonomics S. 2014; 4:1-4. https://doi.org/10.4172/2165-7556.S4-005.
12. Daneshmandi H, Kee D, Kamalinia M, Oliaei M, Mohammadi H. An ergonomic intervention to relieve musculoskeletal symptoms of assembly line workers at an electronic parts manufacturer in Iran. Work. 2018; 61(4):515-21. https://doi.org/10.3233/WOR-182822. PMid:30475781.