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**INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES**<http://doi.org/10.5281/zenodo.1299333>Available online at: <http://www.iajps.com>**Research Article****A CROSS-SECTIONAL RESEARCH ON THE PHYSICAL
DISCOMFORTS AS EXPERIENCED BY THE RESIDENTS AND
SURGEONS DURING MINIMAL INVASIVE SURGERIES (MIS) AT
ALLIED HOSPITAL, FAISALABAD****¹Dr. Muhammad Hassan Aftab, ²Dr. Ayesha Mustafa, ³Dr. Komal Sakhawat**¹Shaikh Khalifa Bin Zayed Al-Nahyan Medical and Dental College, Lahore²Institution Rawalpindi Medical college.³Rawalpindi Medical College/ HFH/ BBH**Abstract:**

Introduction: There have been a minimum occurrence of invasive surgeries on subjects with well-known positive features being utilized in numerous surgical fields which include obstetrics and gynecology surgeries, general surgery, cardio thoracic, urology, etc. Surgeon's focus and concentration with associated specialized skills are mandatory for fine outputs as demanded by the MIS.

Objectives: Research was aimed at the knowledge assessment about the surgeons of Allied Hospital, Faisalabad in the timeframe of January, 2016 to March, 2017. We studied the trend of self-reported ergonomics guidelines adherence by the residents and surgeons during minimal invasive surgical interventions exercise in the allied departments of Allied Hospital, Faisalabad.

Methodology: Study Design: Design of the research was cross-sectional.

Procedure: We employed a questionnaire as a tool to extract information and data about the objective of the particular research. Forty-eight doctors were given the copies of said questionnaire. Doctors were given ample time (five days) to fill the questionnaires. Out of forty-eight, forty-three doctors responded. The response rate in the overall doctors working in the hospital was under fifty percent as (46%). We considered practice duration, per day total working hours, MIS per week and per month by the surgeons. Associated factors of operating room were also considered such as monitor height, monitor size and table height. The physical discomfort was considered in the shape of pain felt in neck, shoulder, arm, knee and feet. We also included question about the requirement of any medical assistance for the remedy of these physical discomforts. Questions were included to inquire about the ergonomic guidelines and comfortable positioning of the hand, eye and target axis.

Data Analysis: Data analysis and entry was made on SPSS software.

Conclusion: Above fifty percent doctors were not aware about the ergonomic guidelines (51%), which was more than expected. A large number of doctors were comfortable with monitor height and size including the table size and height. Incidence of neck pain was observed in (46.5%) residents and surgeons which is also high and alarming. Pain was complained during and after surgeries. Less repeated pains were shoulder pain, arm pain, knee and feet pain. Physical discomfort was mainly linked with the lower height of the table which caused various reported pains by the residents and surgeons. Fourteen-inch monitors were less comfortable than the twenty-six-inch screens

Keywords: Doctors, Residents, Occupational Hazards and Field of Orthopedic Surgery.

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INTRODUCTION:

Minimal invasive surgeries have been performed on the patients for the well-known advantages of it and it has been used in several fields of surgery such as general surgery, gynecology & obstetrics, urology and cardio thoracic etc. Concentration of surgeon and his quality of skill required is very high especially when it comes to fine work required in MIS. Hence there is an increasing need to follow basic ergonomic guidelines to make it relatively easy for the surgeons and improve their efficiency and safety of the procedures. Ergonomics is defined by International Ergonomics Association as: "Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance."

Surgeons working in operating rooms which have not been designed according to their comfort and needs make them prone to musculoskeletal pain and injuries (1). Designing a surgical unit by keeping in view the needs and comfort of surgeons is not only likely to make their job easy but also help their confidence and reduce their stress (2). Factors that are most likely to affect his/her approach are the height of the table and the size and height of monitor. The staff should be able to adjust these according to the need but due the lack of understanding and ignorance of ergonomic guidelines, surgeons may perform MIS in a way which is either not safe or a cause of discomfort. This research will study the correlation between table height, monitor height and size and the development of pain in neck, arms, shoulder, knee or feet and also the awareness regarding ergonomic guidelines among the surgeons of Allied Hospital.

Literature Review

A research conducted by Matern & Koneczny (2007) studied ergonomics in the operating room with the objective to address the lack of information regarding the working conditions in the operating room and it showed the results that there were elementary ergonomic deficiencies within all fields and many surgeons said that these deficiencies lead to potential hazards for patients and staff, potentially on a frequent basis. 97% of the surveyed surgeons see ergonomic improvement in operating room as necessary (3).

A study which focused primarily on the posture and axial skeletal and upper extremity movements during laparoscopic surgery conducted by Nguyen *et al.* (2001) concluded that laparoscopic surgery involved

a posture of the neck and trunk that should be more static, but more frequent movements of the upper extremities than other surgeries. Ergonomic changes in the operation theatre environment and instrument design could ease the stress imposed on surgeons during laparoscopic operations (4).

Szeto *et al.* (2009) conducted a survey on work-related musculoskeletal symptoms among the surgeons of Hong Kong. The results indicated a high prevalence rate of work-related musculoskeletal symptoms in surgeons in the neck (83%), lower back (68%), shoulder (58%) and upper back (53%) areas. Staying in the same posture and certain small movements was perceived as the factor commonly associated with neck symptoms by 89% of the respondents. The study concluded that there was a strong association between the physical and psychosocial factors with the musculoskeletal symptoms in surgeons (1).

Objectives

1. To assess the awareness of ergonomic guidelines in surgeons of Allied Hospital.
2. To study the level of self-reported adherence to ergonomics guidelines in minimally invasive surgeries by surgeons and residents working in surgical and allied disciplines at Allied Hospital.

Aim

The study is conducted to find out if there is a significant relationship between the table height, monitor height & size and musculoskeletal pain occurring in the surgeons during or after surgery and to check their comfort level within their work environment.

Hypotheses

1. There will be significant association between the height of monitor and neck pain.
2. There will be a significant association between the size of monitor and neck pain.
3. There will be significant association between height of the table being used and knee pain.
4. There will be significant association between the height of the table being used and shoulder pain.
5. There will be a significant association between the height of the table being used and arm pain.
6. There will be significant association between working hours per day and feet pain.

7. There will be a negative correlation between comfortable eye-hand-target axis and arm pain.

METHODOLOGY:

Inclusive Criteria

The study was conducted within Allied Hospital, Faisalabad and surgeons who were included in it were faculty members (professors, associate professors, assistant professors), post-graduate trainees (trainee registrars, senior house officers, senior registrars, senior medical officers) and belonged to the departments of general surgery, gynae & obs., ophthalmology and ENT. The nurses and members of the paramedical staff were not included in the study.

Study Design

It is a cross-sectional study.

Procedure

The study was conducted with the help of a questionnaire. The copies of the questionnaire were handed out from January, 2016 to March, 2017 to 48 available doctors of the above-mentioned departments at the time of distribution of the questionnaires and were collected by August 23, 2017. A total of 43 doctors responded by returning

answered questionnaires. With a total of 94 doctors working in these departments according to the list provided by the administration, the response rate was 46%.

Duration of practice as a surgeon was considered along with total working hours per day, per week and the number of MIS performed per week and per month. Operating room factors considered were height of monitor, size of monitor and height of the table used. Factors of physical discomfort considered were neck pain, shoulder pain, arm pain, knee pain and pain in feet and it was also asked if it needed medication or not. They were also asked if they were comfortable with their eye-hand-target axis and if they were aware about ergonomic guidelines.

Data Analysis

Data collected, was entered into SPSS version 21. Then frequencies and correlations between different variables were observed and were noted down. Hypotheses formulated about the expected association between operating room factors (table height, monitor height and size) and physical discomfort (neck, shoulder, knee, arm, feet pain) were tested with Chi-Square tests and results were noted and conclusions were made.

RESULTS:

Respondents Characteristics

Of the doctors who responded only three were faculty members (7%) while the rest did not belong to faculty.

Table 1: Designations of Respondents

| Designation of Respondents | Number of Respondents Percent | Percent |
|----------------------------|----------------------------------|---------|
| Assistant Professor | 1 | 2.3 |
| Associate Professor | 2 | 4.7 |
| Senior House Officer | 3 | 7.0 |
| Senior Medical Officer | 1 | 2.3 |
| Senior Registrar | 1 | 2.3 |
| Trainee Registrar | 33 | 76.7 |
| Trainee Registrar (MS) | 2 | 4.7 |
| Total | 43 | 100.0 |

42% of the respondents belonged to general surgery department.

Table 2: Respondents' Distribution According to the Department they belong

| Department | Number of Respondents | Percent |
|-------------------------|-----------------------|---------|
| ENT | 6 | 14.0 |
| G. S. | 18 | 41.9 |
| Gynecology & Obstetrics | 12 | 27.9 |
| Ophthalmology | 7 | 16.3 |
| Total | 43 | 100.0 |

Self-reported Awareness

21 out of 43 doctors surveyed, which is about 51%, reported unawareness with ergonomic guidelines. While 20 reported that they have knowledge of ergonomic guidelines (46.5%). 2 didn't respond to the question.

Height of Monitor

33 of the total 43 surgeons (76.7%) said that the monitor they used was at their eye level. 9 out of 43 said it was above eye level (20.9%) and 1 said it was below eye level (2.3%).

Of those (33) who said that the monitors they use are at their eye level, 27 reported that they were comfortable with it (81%) and rest of the 6 mentioned that it should be either above or below their eye level. 31 out of 43 were comfortable with whatever the height of monitor they were using which is a 72% satisfaction rate.

Table 3: Height of the Monitor in Use * Comfortable Height of Monitor

| | | Comfortable Height of Monitor | | | Total | Pearson Chi-Square Value |
|------------------------------|-----------------|-------------------------------|-----------------|-----------------|-------|--------------------------|
| | | At Eye Level | Above Eye Level | Below Eye Level | | |
| Height of the Monitor in Use | At Eye Level | 27 | 4 | 2 | 33 | 0.003 |
| | Above Eye Level | 6 | 3 | 0 | 9 | |
| | Below Eye Level | 0 | 0 | 1 | 1 | |
| Total | | 33 | 7 | 3 | 43 | |

Size of the Monitor

20 out of 43 reported their monitor size to be 14 inches (46.5%), 21 (48.8%) to be 26 inches and 2 (4.7%) to be greater than 26 inches.

22 out of 43 (51%) were not satisfied with the size of monitor they were using and reported that they might be comfortable using a bigger screen. 20 (46.5%) said that >26-inch screen would be satisfactory for their use. Least number of surgeons showing satisfaction with the size of their monitors were those using one of 14 inches while there was a significant satisfaction with surgeons using 26 inch and greater than 26-inch screens.

Table 4: Size of Monitor * Comfortable Size of Monitor

| | | Comfortable Size of Monitor | | | Total | Pearson Chi-Square Value |
|---------------------|------|-----------------------------|-----|------|-------|--------------------------|
| | | 14" | 26" | >26" | | |
| Size of the Monitor | 14" | 6 | 4 | 10 | 20 | 0.008 |
| | 26" | 0 | 13 | 8 | 21 | |
| | >26" | 0 | 0 | 2 | 2 | |
| Total | | 6 | 17 | 20 | 43 | |

Height of Table

26 out of 43 (60.5%) said that the table on which they perform surgeries has a height which is about their umbilical level. 15 (34.9%) said their table's height is above umbilical level and 2 (4.7%) reported it to be below umbilical level.

Out of 26 who reported that the height of the table they use is about their umbilical level, 24 said that they were comfortable with the height of the table (92%), and out of 15 who said that their table's height was above their umbilical level, 11 were satisfied with it (73%). A total of 35 out of 43 were comfortable with their table's height (81%).

Table 5: Height of Table * Comfortable Height of Table

| | | Comfortable Height of Table | | | Total | Pearson Chi-Square Value |
|-----------------|-----------------------|-----------------------------|-----------------------|-----------------------|-------|--------------------------|
| | | At Umbilical Level | Above Umbilical Level | Below Umbilical Level | | |
| Height of Table | At Umbilical Level | 24 | 1 | 1 | 26 | 0.000 |
| | Above Umbilical Level | 4 | 11 | 0 | 15 | |
| | Below Umbilical Level | 2 | 0 | 0 | 2 | |
| Total | | 30 | 12 | 1 | 43 | |

Frequency of Neck Pain

20 out of 43 reported neck pains during or after surgery (46.5%) while 23 did not which is about 53.5% of the total.

Frequency of Shoulder Pain

11 out of 43 reported shoulder pains during or after surgery (25.6%) while 32 said they haven't encountered shoulder pain (74.4%).

Frequency of Arm Pain

14 out of 43 said they have felt arm pain during or after surgery one time or another (32.6%) while 29 said they do not (67.4%).

Frequency of Knee Pain

7 out of 43 said they have felt knee pain during or after surgery one time or another (16.3%) while 36 (83.7%) said they haven't.

Frequency of Feet Pain

17 out of 43 said they have felt feet pain during or after surgery one time or another (39.5%) while 26 said they haven't (60.5%).

Hypothesis 1: There will be significant association between the height of monitor and neck pain.

Table 4 below shows cross tabulation between height of monitor in use and occurrence of neck pain during surgery. Chi-Square analysis shows there is no significant association between height of monitor and neck pain.

Table 6: Height of the Monitor in Use * Neck Pain during Surgery

| | | Neck Pain During Surgery | | Total | Pearson Chi-Square Value |
|------------------------------|-----------------|--------------------------|----|-------|--------------------------|
| | | Yes | No | | |
| Height of the Monitor in Use | At Eye Level | 17 | 16 | 33 | 0.401 |
| | Above Eye Level | 3 | 6 | 9 | |
| | Below Eye Level | 0 | 1 | 1 | |
| Total | | 20 | 23 | 43 | |

Hypothesis 2: There will be a significant association between the size of monitor and neck pain.

Table 5 below shows cross tabulation between size of monitor in use and occurrence of neck pain during surgery. Chi-Square analysis shows there is no significant association between size of monitor and neck pain.

Table 7: Size of Monitor * Neck Pain during Surgery

| | | Neck Pain During Surgery | | Total | Pearson Chi-Square Value |
|-----------------|------|--------------------------|----|-------|--------------------------|
| | | Yes | No | | |
| Size of Monitor | 14" | 8 | 12 | 20 | 0.266 |
| | 26" | 10 | 11 | 21 | |
| | >26" | 2 | 0 | 2 | |
| Total | | 20 | 23 | 43 | |

Hypothesis 3: There will be significant association between height of the table being used and knee pain. When this hypothesis was tested with Chi-Square, it showed remarkable results. Those surgeons who reported that the height of the table on which they perform surgeries was about the level of their umbilical region or above umbilical region, showed no significant association with knee pain and majority of them did not complain of knee pain. But the two of the total forty-three who reported that their table's height did not match their umbilical region and is low also reported that they suffer from knee pain. This can be explained by the fact that surgeons working on low table heights have to keep their standing posture a little awkwardly bent to have a comfortable approach towards the patient. Back pain has not been studied in this research; otherwise, it would have been interesting to note the association here.

Table 8: Height of Table * Knee Pain during Surgery

| | | Knee Pain During Surgery | | Total | Pearson Chi-Square Value |
|-----------------|-----------------------|--------------------------|----|-------|--------------------------|
| | | Yes | No | | |
| Height of Table | At Umbilical Level | 1 | 25 | 26 | 0.001 |
| | Above Umbilical Level | 4 | 11 | 15 | |
| | Below Umbilical Level | 2 | 0 | 2 | |
| Total | | 7 | 36 | 43 | |

Hypothesis 4: There will be significant association between the height of the table being used and shoulder pain. When this hypothesis was tested with Chi-Square, it showed remarkable results. Those surgeons who reported that the height of the table on which they perform surgeries was about the level of their umbilical region or above umbilical region, showed no significant association with shoulder pain and majority of them did not complain of shoulder pain. But the two of the total forty-three who reported that their table's height did not match their umbilical region and is low also reported that they suffer from shoulder pain. This can be explained by the fact that surgeons working on low table heights have to keep their standing posture a little awkwardly bent to have a comfortable approach towards the patient.

Table 9: Height of Table * Shoulder Pain during Surgery

| | | Shoulder Pain During Surgery | | Total | Pearson Chi-Square Value |
|-----------------|-----------------------|------------------------------|----|-------|--------------------------|
| | | Yes | No | | |
| Height of Table | At Umbilical Level | 7 | 19 | 26 | 0.030 |
| | Above Umbilical Level | 2 | 13 | 15 | |
| | Below Umbilical Level | 2 | 0 | 2 | |
| Total | | 11 | 32 | 43 | |

Hypothesis 5: There will be a significant association between the height of the table being used and arm pain. When this hypothesis was tested with Chi-Square, it showed remarkable results. Those surgeons who reported that the height of the table on which they perform surgeries was about the level of their umbilical region or above umbilical region, showed no significant association with arm pain and majority of them did not complain of arm pain. But the two of the total forty-three who reported that their table's height did not match their umbilical region and is low also reported that they suffer from arm pain. This can be explained by the fact that surgeons working on low table heights have to keep an awkward upper extremity posture to have a comfortable approach towards the patient.

Table 10: Height of Table * Arm Pain during Surgery

| | | Arm Pain During Surgery | | Total | Pearson Chi-Square Value |
|-----------------|-----------------------|-------------------------|----|-------|--------------------------|
| | | Yes | No | | |
| Height of Table | At Umbilical Level | 6 | 20 | 26 | 0.061 |
| | Above Umbilical Level | 6 | 9 | 15 | |
| | Below Umbilical Level | 2 | 0 | 2 | |
| Total | | 14 | 29 | 43 | |

Hypothesis 6: There will be significant association between working hours per day and feet pain.

Table 9 shows cross-tabulation between working hours per day of a surgeon and feet pain. Chi-Square test shows that there is no significant association between working hours in a day and feet pain.

Table 11: Working Hours per Day * Feet Pain during Surgery

| | | Feet Pain During Surgery | | Total | Pearson Chi-Square Value |
|-----------------------|-------|--------------------------|----|-------|--------------------------|
| | | Yes | No | | |
| Working Hours per Day | 6.00 | 6 | 9 | 15 | 0.791 |
| | 7.00 | 3 | 3 | 6 | |
| | 8.00 | 6 | 8 | 14 | |
| | 9.00 | 0 | 1 | 1 | |
| | 10.00 | 2 | 2 | 4 | |
| | 14.00 | 0 | 2 | 2 | |
| | 15.00 | 0 | 1 | 1 | |
| Total | | 17 | 26 | 43 | |

Hypothesis 7: There will be a negative correlation between comfortable eye-hand-target axis and arm pain.

Table 10 shows cross tabulation between comfortable eye-hand-target axis and arm pain. Chi-Square test shows that there is no significant association between comfortable eye-hand-target axis and arm pain although there is an increase in percentage of the surgeons reporting arm pain who also report uncomfortable eye-hand-target axis.

Table 12: Comfortable Eye-Hand-Target Axis * Arm Pain during Surgery

| | | | | Arm Pain During Surgery | | Total | Pearson Chi-Square Value |
|----------------------------------|-----|----|----|-------------------------|-------|-------|--------------------------|
| | | | | Yes | No | | |
| Comfortable Eye Hand Target Axis | Yes | 11 | 25 | 36 | 0.525 | | |
| | No | 3 | 4 | 7 | | | |
| Total | | | | 14 | 29 | 43 | |

DISCUSSION:

A majority percentage (51%) of surgeons in Allied Hospital, Faisalabad are unaware of ergonomic guidelines which is higher than expected and it also makes it even harder to work for and implementing a system resulting in quality ergonomic conditions for surgeons. The study conducted by Modi, Kuswaha, Dave (2007) in three medical colleges and teaching hospitals of Ahmedabad concluded with 64% of the surgeons reporting that they were aware of ergonomic guidelines regarding laparoscopic surgery while the practice of it were somewhat lower at about 54% and 4% respectively in terms of table height and monitor height. They hadn't studied the causes of this lower practice and commented that it may be due the nonadjustable table and monitor height. In Allied Hospital, despite the fact that a large number of surgeons are unaware of ergonomic guidelines, they have defined their comfort zone especially when it comes to table height and monitor height but not in the case of the size of monitor (2). The causes have not been studied in this research either but it can be explained by the adjustable height of the tables and monitors used here. Size of monitors installed by the hospital administration being nonadjustable, creates discomfort for many surgeons.

The study conducted by Szeto, et al. (2009) among the surgeons in Hong Kong reported that 82.9% surgeons feel pain in the neck during or after surgeries. Through this we may infer that a surgeon's neck is vulnerable to musculoskeletal pain due to a sustained posture during surgery (1). In our study which was conducted in Allied Hospital, physical discomfort was found less prevalent but those who did report a physical discomfort the chief complaint was also found to be of neck pain with 46.5% saying that they feel neck pain during or after surgery but don't require any medication for its cure. This means that although physical discomfort is an issue, it is not a serious one here.

It was expected that there would be close association between operating room factors and physical discomfort and several assumptions were made regarding this. But the results proved that there was little association between uncomfortable monitor height and neck pain etc. with only bad table height knowing to cause knee, arm, shoulder pain. Bad table height causes a surgeon to remain in a sustained awkward and uncomfortable posture which results in several health issues.

Study conducted by Wauben, Veelen, Gossot & Goossens (2006) had similar results to this study. On the whole, almost 80% respondents reported neck,

shoulder and back discomforts and there was no specific cause for these physical discomforts. But the information which turned out to be the hallmark of that research was that a clear majority (89%) of respondents, similar to this study, were unaware of the ergonomic guidelines. Study concluded with the statement that lack of ergonomic guidelines was a major problem in the operating room (5).

CONCLUSION:

Above fifty percent doctors were not aware about the ergonomic guidelines (51%), which was more than expected. A large number of doctors were comfortable with monitor height and size including the table size and height. Incidence of neck pain was observed in (46.5%) residents and surgeons which is also high and alarming. Pain was complained during and after surgeries. Less repeated pains were shoulder pain, arm pain, knee and feet pain. Physical discomfort was mainly linked with the lower height of the table which caused various reported pains by the residents and surgeons. Fourteen-inch monitors were less comfortable than the twenty-six-inch screens

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