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*Article*

# The Relationship Between Surgical and Operating Room Practice During Hajj Season, Makkah, Saudi Arabia, 2024: A Comparative Study

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**Abstract:** Introduction: There is a remarkable paucity of research that studies the surgical and operating room (O.R.) practice during Hajj, as well as those compares such practice before and during Hajj, since most of the available reports concentrated on other topics. Surgical problems, either acute surgical emergencies or precipitation of chronic disease, are not uncommon during the Hajj season. Prolonged surgical wait times have been associated with reduced quality of life. Cancellation of surgical operations in hospitals is a significant problem with many undesirable consequences. Cancelled operations can annoy patients and their families. They are a major drain on health resources, increase theater costs, result in wasted operating room time, and decrease efficiency. Therefore, the objective of the current study is to compare the surgical and O.R. practice in Makkah Healthcare Cluster (MHCC) hospitals before and during Hajj 2024. Methodology: A retrospective data analysis using all medical records of the operation rooms departments in MHCC hospitals before Hajj 2024 (Jan-Feb-March) and during Hajj 2024 (April-May-June) (including both pilgrims and non-pilgrims). Results: There is a statistically significant difference between surgery waiting lists for different specialties. P = 0% as well as between surgery waiting lists and different MHCC hospitals. P = 0% The highest waiting list was for general surgery (8735 cases), and the lowest was for the vascular surgery waiting list (490 cases). The highest waiting list was in KAMC (15,473 cases), followed by Al-Noor Specialist Hospital (15,471 cases), and the lowest was in Al-Kamel Hospital (0 cases). There is a statistically significant difference between the type of surgery performed for different specialties (P = 0%) as well as between the type of surgery performed and different MHCC hospitals (P = 0%). General surgery operations are the most common type of operation done in MHCC (1753 cases) compared to oral surgery, which was the least common type of surgical operation performed (74 cases). KAMC was the highest hospital in surgery performance (2704 cases), followed by the maternal and children's hospital (2273 cases). No statistically significant differences between elective surgeries and emergency surgeries are noted between different MHCC hospitals. P = 14% Statistically significant differences between the Operation Room (OR) Surgical Cancellation Rate and the Operation Room (OR) Utilization Rate are noted between different MHCC hospitals (P-Value = 1%). The ratio of emergent surgery to elective surgery (Ee ratio) = 7010.05 / 8802 = 0.7964 = 79.64%. No statistically significant differences between the operating room (OR) surgical cancellation rate and the day surgery cancellation rate are noted between different MHCC hospitals. P-Value = 7% No statistically significant differences between day of admission to day of surgery (percent) and day surgery (percent) are noted between different MHCC hospitals. P-Value = 8% Statistically significant differences between unplanned admission following discharge and day surgery conversion to admission are noted between different MHCC hospitals. P-Value = 1% There is a statistically

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significant difference among elective surgeries performed regularly before Hajj compared to such practice during Hajj season (P=0.049), as well as for emergency surgeries (P=0.002), day surgery (P=0.02), day surgery conversion to admission (P=0.02), vascular surgery (P=0.025), orthopedics (P=0.006), neurosurgery (P=0.04), general surgery (P=0.0004), and ear-nose-throat (ENT) (P=0.039). Conclusion & Recommendations: Approaches to improving the surgical and O.R. practice in MHCC hospitals can occur on many levels based on the required level of resources and institutional support. Data transparency and communication are critical to improvements, and any intervention should be conducted in the context of overall patient care, especially during Hajj seasons. Such interventions may include improving the quantities and quality of that practice as well as improving the equity and equality distribution of surgical and O.R. manpower, materials, and machines in order to shorten the O.R. waiting list and surgery cancellation rates and improve the O.R. utilization rates in order to attain the goals of value-based health care and a new model of care. To measure operating room (OR) performance and efficiency, hospitals need scorecards or dashboards displaying and tracking core performance indicators. Scorecards should be monitored on an ongoing basis and benchmarked both internally against performance over time and externally against established best practices with the intent of continuous performance improvement. Among the lessons learned from the current study is the need for large-scale scientific studies, including qualitative and quantitative ones, to quantify the factors related to surgical and OR practice. Different types of surgery represent a threat in light of the expected increasing number of pilgrims after the completion of construction in the Grand Mosque and Al-Mashaeer areas of the Hajj. The vast development in surgery problem surveillance after the development of the web-based healthcare network is a welcome achievement of the Saudi Ministry of Health. The optimal utilization of the collected data is yet to be achieved. The existing international collaboration needs to be strengthened and expanded. Application of a new metric for surgical care access and delivery, the ratio of emergent surgery to elective surgery (Ee ratio), is essential.

**Keywords:** Relationship; surgical; operating room; practice; Hajj season; Makkah; Saudi Arabia; Comparative Study

## 1. Introduction

The Hajj pilgrimage is one of the greatest mass gatherings in the world, and presents unique public health challenges. Millions of Muslims from around the world gather annually to perform the Hajj pilgrimage in Mecca, in Saudi Arabia. Hajj is one of the 5 pillars of Islam; therefore, it is mandatory for all Muslims, who are physically and financially capable, to make the journey to Mecca once in a lifetime. [1]

The Saudi Ministry of Health provides free health servic es for all pilgrims during the Hajj period.[1]

Pilgrims performing the Hajj are predisposed to diverse and significant health risks, due to the limited time and confined geographical area of the event, and the large numbers of people, with population densities among the millions of participants, reaching 7 persons/m2 [2]

Surgical problems, either acute surgical emergency or precipitation of chronic disease, are not uncommon during the Hajj season. In a study conducted in 2003 and 2004, 177 patients were admitted to a surgical ward [3] Most of the patients were male (78.5%), and the mean age of patients was 52.7 years; however, 41% of patients were aged > 60 years [3]The most common causes of admission were acute appendicitis and diabetic foot, followed by traumatic injuries and obstructed hernias [3]Nearly half of the patients (49.1%) received surgical treatment, while 39% were managed conservatively, and 11.3% of patients left the hospital against medical advice [3]

The mass movement of millions of pilgrims from one ritual place to another, in a short time and in a small area, significantly increases the risk of trauma. Numerous accidents and injuries face Hajj pilgrims, such as falling, sliding, stampede, and traffic accidents [4] Most of the traumas usually occur

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during the rituals of Tawaf, Saee and Ramy al-jamarat [4] ,Trauma account ed for 9.4% [5]of hospital admissions and 6.4% [6]of ICU admissions.

The incidence of head and eye injuries during Ramy al-jamarat in 2005 was significantly low er than in 2004 [7]This improvement may have been due to the changed structure of Ramy al-jamarat in Hajj 2005. In contrast, the rate of all-cause fractures in 2005 was higher than in 2004 among Iranian pilgrims, perhaps because of increased overcrowding [7]Fire may also be considered among the causes of traumatic injuries. The incidence of burns was about 40/10 000 [4]However, cooking food is not allowed at Mina, and smoking is forbidden during the Hajj by Islamic teaching, thus reducing the risk of fires.

Elective surgery is an important part of a hospital's workload. Unanticipated postponement on the day of surgery is a tremendous emotional as well as economical trauma for such patients in addition to causing an increase in operation theatre costs and decrease in its efficiency[8]

Cancellation of surgical operations in hospitals is a significant problem with many undesirable consequences. Cancelled operations can annoy patients and their families. They are a major drain on health resources, increases theatre costs, results in wasted operating room time and decreases efficiency. However, the performance of a surgical operation on schedule requires a complex process of logistics. In spite of the extensive available literature on preparation of surgical patients and performance of surgical procedures, the focus given to the cancellation of planned surgical operations has been quiet restricted globally[9]

Elective surgery is an important part of a hospital's workload. Whenever a case is put on list, it involves interaction of a number of people and in the same way its postponement affects many parties [10] Different definitions of cancellation exist in the international literature [11]. Some authors define 'cancellation' as only those procedures that were cancelled on the day on which surgery was scheduled, whereas others also include those that were cancelled on the previous day [12,13].

Surgical care is essential to health systems but remains a challenge for low- and middle-income countries (LMICs). Current metrics to assess access and delivery of surgical care focus on the structural components of surgery and are not readily applicable to all settings. A new metric for surgical care access and delivery, the ratio of emergent surgery to elective surgery (Ee ratio), which represents the number of emergency surgeries performed for every 100 elective surgeries.[14]

Day surgery is a modern and cost-effective method to treat surgical patients. In many countries, this accounts for greater than 50% of the surgical load. However, apart from reducing health care cost, there is also a need to maintain quality care. Defining this quality is difficult. Unanticipated admission after day surgery can be a good indicator as it concerns the basic goals of same day discharge. [15]Unanticipated admission was defined as unplanned admission after a day surgical procedure[15]

Day surgery is defined as a patient being admitted to hospital for a planned procedure and discharged home the same calendar day. This typically incorporates a stay of 4–6 h, but with more complex surgical procedures, longer stays may be required.[16]

The staffed hours of operation in any surgical facility are a valuable institutional resource. The realistic target for the utilization of this resource is dependent on many factors including scheduling, efficiency, and culture of the facility[17]

Nearly two-thirds of all hospitalizations involve some type of procedure. Many procedures that occur in the hospital setting, such as blood transfusions and vaccinations, are performed outside the operating room (OR). Other procedures, such as hip replacement and spinal fusion, are surgical in nature and are performed in the OR. In 2011, nearly 29 percent of hospital stays involved OR procedures and 48 percent of hospital costs were for stays that involved OR procedures. [18] Mean hospital costs for stays with OR procedures were more than double the mean costs for stays without OR procedures.[19]

Health waiting lists in general and surgical waiting list in particular are a problem for the majority of the European countries with a National Health System.[20]

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Prolonged surgical wait times have been associated with reduced quality of life (QoL) in patients requiring orthopedic surgery[21]

Therefore, the objective of the current study will include the following:

1. To identify the regular pattern of surgical practice in Makkah healthcare cluster hospitals during 2024 (from 1-02-2024 till 30-04-2024).
2. To identify the pattern of surgical practice in Makkah healthcare cluster hospitals during Hajj season 2024 (from 1-05-2024 till 31-07-2024).

Aiming to help in future planning including the total staffing, the best management facilities, and the cost required to provide them with proper surgical care to the distinguished guests while performing the Hajj.

The present study's findings will help future researchers, decision-makers, and study replication.

## 3. Methodology

The study was conducted at Makkah healthcare cluster hospitals after approval from its Institutional Review Board. (IRB Number: H-02-K-076-0624-1142)

The researcher and his team will conduct retrospective data analyses using the medical records of the operation rooms departments in Makkah Healthcare Cluster Hospitals during 2024 (from 1-02-2024 till 30-04-2024) and during Hajj season 2024 (from 1-05-2024 till 31-07-2024).

All subjects with missing data are not included in the analysis or standard statistical procedures.

All patients admitted to the operation rooms in Makkah Healthcare Cluster Hospitals during 2024 (from 1-02-2024 till 30-04-2024) and during Hajj season 2024 (from 1-05-2024 till 31-07-2024). will be included in the study, Patients with minor surgical problems will be excluded.

Each patient will be followed until discharge, transferred to another hospital, or announced dead.

Patients with minor surgical problems and who received emergency treatment and were discharged from the emergency or received dead or died in the emergency room before admission will be excluded from the study. Minor surgical problems are defined as a set of procedures in which short surgical techniques are applied on superficial tissues, usually with local anesthesia, and minimal complications, that usually do not require postoperative resuscitation and need minimal equipment, many of which are used daily, and can be easily and safely performed in a short amount of time during a clinic visit 10.

The outcome of these patients will be determined on a short-term basis, as mandated by the working system of these hospitals

The data will be analyzed using SPSS version 21.

The data were analyzed using SPSS version 21.0. Numerical data were given as means and standard deviations, or medians and interquartile ranges. ANOVA, Mann-Whitney U tests, and Kruskal-Wallis tests were used to compare data distributions. The categorical variables were compared using chi-squared testing.

Ethical issues:

The data gathered will be kept strictly confidential, will never be shared, and will only be utilized by the researcher and his fellow investigators for research purposes.

The data will not be kept after the study for any reason; it will only be utilized for research purposes.

No personal information (name, ID, etc.) will be utilized in the present study in order to preserve study privacy.

The hospitals in the Makkah Healthcare Cluster and the Ministry of Health will not be accountable for any financing concerns as the study will be self-funded.

If the study is published, the people listed in the proposal will be included as co-authors.

Anyone who contributed to the study will have their name listed in the acknowledgment.

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The author will submit the proposal back to the IRB committee for review before publication if the study's findings are promising.

## 3. Results

There is a statistically significant difference between surgery waiting lists for different specialties P = 0% as well as between surgery waiting lists and different MHCC hospitals P = 0%

The highest waiting list was for general surgery (8735 cases) and the lowest was vascular surgery waiting list (490 cases) and the highest waiting list was in KAMC (15473 cases) followed by Al-Noor Specialist hospital (15471 cases) and the lowest was in Al-Kamel Hospital (0 cases).

There is a statistically significant difference between type of surgery performed for different specialties P = 0 % as well as between type of surgery performed and different MHCC hospitals P = 0%

General surgeries operations are the most common type of operation done in MHCC (1753 cases) compared to the oral surgery which was the lowest type of surgical operation performed (74 cases). KAMC was the highest hospital in surgery performance (2704 cases) followed by maternal and children hospital (2273 cases).

No Statistically significant differences between Elective Surgeries and Emergency Surgeries are noted between different MHCC hospitals P = 14%

Statistically significant differences between Operation Room (OR) Surgical Cancellation Rate and Operation Room (OR) Utilization Rate are noted between different MHCC hospitals P-Value = 1%

The ratio of emergent surgery to elective surgery (Ee ratio) = 7010.05 / 8802 = 0.7964 =79.64%

No Statistically significant differences between Operation Room (OR) Surgical Cancellation Rate and Day Surgery Cancellation Rate are noted between different MHCC hospitals P-Value = 7%

No Statistically significant differences between Day of admission to day of Surgery (percent) and Day Surgery (percent) are noted between different MHCC hospitals P-Value = 8%

Statistically significant differences between Unplanned Admission Following Discharge and Day Surgery Conversion to Admission are noted between different MHCC hospitals P-Value = 1%

There is a statistically significant difference among Elective Surgeries performed regularly before Hajj compared to such practice during Hajj season P=0.049 as well as for Emergency Surgeries P=0.002, Day Surgery P=0.02, Day Surgery Conversion to Admission P=0.02, Vascular Surgery P=0.025, Orthopedics P=0.006, Neuro Surgery P=0.04, General Surgery P=0.0004 and Ear-Nose-Throat (ENT) P=0.039

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| Pattern of Surgical Practice in Makkah Health Care Cluster (MHCC) Hospitals 2024 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Day Surgery Cancellation Rate | Operation Room (OR) Surgical Cancellation Rate. | Operation Room (OR) Utilization Rate. | Elective Surgeries (%) | Emergency Surgeries (%). | Elective Surgery Volume | Emergency Surgeries Volume | Month/Hospital 2024 |
| **0** | **0** | **0** | **0** | **3.5** | **0** | **5** | **Total cases in Alkamel hospital** |
| **0** | 0 | 0 | 0 | 3.5 | 0 | 5 | 6 (JUN) |
| **1.39** | **1.65** | **15.1115** | **16.82** | **8.275** | **1013** | **461** | **Total cases in Hera general hospital (HGH)** |
| **0.41** | 0.41 | 2.93 | 3.52 | 1.48 | 217 | 93 | 1 (JAN) |
| **0.19** | 0.35 | 2.415 | 2.81 | 1.19 | 179 | 77 | 2 (FEB) |
| **0.28** | 0.31 | 2.72 | 2.55 | 1.45 | 147 | 81 | 3 (MAR) |
| **0.3** | 0.22 | 1.464 | 1.91 | 2.23 | 72 | 68 | 4 (APRIL) |
| **0.09** | 0.21 | 2.566 | 3.27 | 1.12 | 185 | 73 | 5 (MAY) |
| **0.12** | 0.15 | 3.0165 | 2.76 | 0.805 | 213 | 69 | 6 (JUN) |
| **0** | **0.52** | **86.755** | **64.58** | **14.27** | **684** | **866** | **Total cases in King Abdulaziz Hospital (KAAH)** |
| **0** | 0.12 | 3.364 | 2.8 | 2.21 | 200 | 154 | 1 (JAN) |
| **0** | 0.1 | 2.96 | 2.26 | 1.66 | 167 | 131 | 2 (FEB) |
| **0** | 0.11 | 2.64 | 1.44 | 2.56 | 92 | 147 | 3 (MAR) |
| **0** | 0.19 | 1.692 | 1.25 | 2.76 | 67 | 106 | 4 (APRIL) |
| **0** | 0 | 75.637 | 56.71 | 1.74 | 148 | 115 | 5 (MAY) |
| **0** | 0 | 0.462 | 0.12 | 3.34 | 10 | 213 | 6 (JUN) |
| **0.08** | **0.245** | **16.9295** | **20.48** | **3.575** | **2717** | **385.05** | **Total cases in King Abdullah Medical City Hospital (KAMC)** |
| 0.01 | 0.07 | 3.858 | 4.52 | 0.48 | 687 | 72 | 1 (JAN) |
| 0.04 | 0.03 | 3.089 | 3.57 | 0.43 | 493 | 58 | 2 (FEB) |
| 0.01 | 0.06 | 2.881 | 3.66 | 0.34 | 411 | 39 | 3 (MAR) |
| 0.02 | 0.03 | 2.205 | 2.87 | 1.13 | 295 | 65 | 4 (APRIL) |
| 0 | 0.04 | 3.095 | 3.51 | 0.49 | 539 | 72.05 | 5 (MAY) |
| 0 | 0.015 | 1.8015 | 2.35 | 0.705 | 292 | 79 | 6 (JUN) |
| **0** | **0.05** | **17.6345** | **7.31** | **17.06** | **442** | **1030** | **Total cases in King Faisal Hospital (KFH)** |
| 0 | 0 | 4.61 | 2.29 | 2.71 | 121 | 143 | 1 (JAN) |
| 0 | 0 | 3.774 | 1.57 | 2.43 | 95 | 149 | 2 (FEB) |
| 0 | 0 | 3.01 | 1.14 | 2.86 | 67 | 167 | 3 (MAR) |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 0.05 | 1.519 | 0.65 | 3.26 | 42 | 174 | 4 (APRIL) |
| 0 | 0 | 3.877 | 1.49 | 2.52 | 93 | 158 | 5 (MAY) |
| 0 | 0 | 0.8445 | 0.17 | 3.28 | 24 | 239 | 6 (JUN) |
| **0** | **0** | **0.058** | **0.9** | **1.35** | **3** | **6** | **Total cases in Khulais Hospital** |
| 0 | 0 | 0.058 | 0.9 | 1.35 | 3 | 6 | 5 (MAY) |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 (JUN) |
| **0** | **0** | **18.4775** | **13.83** | **10.29** | **2271** | **1532** | **Total cases in maternity& children Hospital (MCH)** |
| 0 | 0 | 3.968 | 2.91 | 2.09 | 443 | 320 | 1 (JAN) |
| 0 | 0 | 2.888 | 2.19 | 1.81 | 343 | 284 | 2 (FEB) |
| 0 | 0 | 3.044 | 2.31 | 1.69 | 312 | 231 | 3 (MAR) |
| 0 | 0 | 2.233 | 1.78 | 2.22 | 227 | 246 | 4 (APRIL) |
| 0 | 0 | 3.091 | 2.44 | 1.56 | 403 | 259 | 5 (MAY) |
| 0 | 0 | 3.2535 | 2.2 | 0.92 | 543 | 192 | 6 (JUN) |
| **2.67** | **3.07** | **17.432** | **8.98** | **15.54** | **1672** | **2725** | **Total cases in Al-Noor specialist Hospital (NSH)** |
| 0.7 | 0.75 | 3.62 | 2.72 | 2.28 | 507 | 432 | 1 (JAN) |
| 0.46 | 0.52 | 2.683 | 1.98 | 2.02 | 372 | 379 | 2 (FEB) |
| 0.35 | 0.49 | 2.282 | 0.87 | 3.13 | 149 | 449 | 3 (MAR) |
| 0.37 | 0.4 | 1.682 | 0.96 | 3.04 | 156 | 403 | 4 (APRIL) |
| 0.54 | 0.65 | 2.977 | 1.88 | 2.12 | 369 | 414 | 5 (MAY) |
| 0.25 | 0.26 | 4.188 | 0.57 | 2.95 | 119 | 648 | 6 (JUN) |
| **4.14** | **5.535** | **172.398** | **132.9** | **73.86** | **8802** | **7010.05** | **Grand Total** |
| | **P-Value = 1%** | | **P-Value = 14%** | | **The ratio of emergent surgery to elective surgery (Ee ratio) = 7010.05 / 8802 = 0.7964 =79.64%** | | |
| **P-Value = 7%** | | | | | | | |

| **Pattern of Surgical Practice in Makkah Health Care Cluster (MHCC) Hospitals 2024** | | | | |
|---|---|---|---|---|
| **Day Surgery Conversion to Admission** | **Unplanned Admission Following Discharge** | **Day Surgery (percent)** | **Day of admission to day of Surgery (percent)** | **Month/Hospital 2024** |
| **0** | **0** | **0** | **0** | **Total cases in Alkamel hospital** |
| **0** | **0** | **0** | **0** | 6 (JUN) |
| **0** | **0** | **13.01** | **15.01** | **Total cases in Hera general hospital (HGH)** |

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| | | | | |
|---|---|---|---|---|
| **0** | **0** | **2.38** | **5** | 1 (JAN) |
| **0** | **0** | **2.1** | **3** | 2 (FEB) |
| **0** | **0** | **2.26** | **1** | 3 (MAR) |
| **0** | **0** | **1.84** | **1.01** | 4 (APRIL) |
| **0** | **0** | **2.36** | **3** | 5 (MAY) |
| **0** | **0** | **2.07** | **2** | 6 (JUN) |
| **0.55** | **0** | **7.25** | **44.02** | **Total cases in King Abdulaziz Hospital (KAAH)** |
| **0.11** | **0** | **1.76** | **7** | 1 (JAN) |
| **0.24** | **0** | **1.5** | **5** | 2 (FEB) |
| **0.2** | **0** | **0.98** | **11** | 3 (MAR) |
| **0** | **0** | **0.94** | **13.01** | 4 (APRIL) |
| **0** | **0** | **1.41** | **4.01** | 5 (MAY) |
| **0** | **0** | **0.66** | **4** | 6 (JUN) |
| **0** | **0** | **16.59** | **24.545** | **Total cases in King Abdullah Medical City Hospital (KAMC)** |
| **0** | **0** | **3.38** | **4.82** | 1 (JAN) |
| **0** | **0** | **2.76** | **3.85** | 2 (FEB) |
| **0** | **0** | **2.82** | **4.24** | 3 (MAR) |
| **0** | **0** | **2.24** | **4.89** | 4 (APRIL) |
| **0** | **0** | **3.03** | **2.87** | 5 (MAY) |
| **0** | **0** | **2.36** | **3.875** | 6 (JUN) |
| **0.07** | **0** | **17.47** | **1** | **Total cases in King Faisal Hospital (KFH)** |
| **0.07** | **0** | **3.89** | **0** | 1 (JAN) |
| **0** | **0** | **3.21** | **0** | 2 (FEB) |
| **0** | **0** | **3.14** | **0** | 3 (MAR) |
| **0** | **0** | **2.47** | **0** | 4 (APRIL) |
| **0** | **0** | **2.92** | **1** | 5 (MAY) |
| **0** | **0** | **1.84** | **0** | 6 (JUN) |
| **0** | **0** | **0** | **0** | **Total cases in Khulais Hospital** |
| **0** | **0** | **0** | **0** | 5 (MAY) |
| **0** | **0** | **0** | **0** | 6 (JUN) |
| **0** | **0** | **14.87** | **6** | **Total cases in maternity& children Hospital (MCH)** |
| **0** | **0** | **3.17** | **2** | 1 (JAN) |
| **0** | **0** | **2.5** | **0** | 2 (FEB) |
| **0** | **0** | **2.64** | **1** | 3 (MAR) |

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| | | | | |
|---|---|---|---|---|
| **0** | **0** | **1.79** | **2** | 4 (APRIL) |
| **0** | **0** | **2.64** | **1** | 5 (MAY) |
| **0** | **0** | **2.13** | **0** | 6 (JUN) |
| **0.02** | **0** | **16.89** | **14** | **Total cases in Al-Noor specialist Hospital (NSH)** |
| **0** | **0** | **3.17** | **5** | 1 (JAN) |
| **0** | **0** | **2.51** | **3** | 2 (FEB) |
| **0** | **0** | **3.64** | **1** | 3 (MAR) |
| **0** | **0** | **2.13** | **2** | 4 (APRIL) |
| **0.02** | **0** | **2.51** | **3** | 5 (MAY) |
| **0** | **0** | **2.93** | **0** | 6 (JUN) |
| **0.64** | **0** | **86.08** | **104.575** | **Grand Total** |
| **P-Value = 1%** | | **P-Value = 8%** | | |

| **The Regular Pattern of Surgical Practice in MHCC Hospitals 2024** | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Type of waiting list** | | | | | | | | | | | | | | | |
| **Total** | **Vascular Surgery** | **Urology** | **Plastic Surgery** | **Pediatrics Surgery** | **Orthopedics** | **Oral Surgery** | **Ophthalmology** | **Obstetrics** | **Neurosurgery** | **General Surgery** | **ENT** | **Dentistry** | **Cardiothoracic** | **Bariatric** | **Month/Hospital 2024** |
| **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **Total cases in Alkamel hospital** |
| | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | 6 (JUN) |
| **10732** | **0** | **0** | **0** | **0** | **0** | **0** | **2798** | **2755** | **0** | **3047** | **1625.48** | **507.15** | **0** | **0** | **Total cases in Hera general hospital (HGH)** |
| | **0** | **0** | **0** | **0** | **0** | **0** | **472** | **497** | **0** | **488** | **287** | **111** | **0** | **0** | 1 (JAN) |
| | **0** | **0** | **0** | **0** | **0** | **0** | **590** | **421** | **0** | **507** | **232** | **96** | **0** | **0** | 2 (FEB) |
| | **0** | **0** | **0** | **0** | **0** | **0** | **629** | **453** | **0** | **528** | **200** | **84** | **0** | **0** | 3 (MAR) |
| | **0** | **0** | **0** | **0** | **0** | **0** | **586** | **499** | **0** | **532** | **151.48** | **50.15** | **0** | **0** | 4 (APRIL) |
| | **0** | **0** | **0** | **0** | **0** | **0** | **365** | **503** | **0** | **572** | **395** | **87** | **0** | **0** | 5 (MAY) |
| | **0** | **0** | **0** | **0** | **0** | **0** | **156** | **382** | **0** | **420** | **360** | **79** | **0** | **0** | 6 (JUN) |
| **2765** | **109** | **94** | **0** | **0** | **637** | **0** | **0** | **0** | **61** | **1733** | **131** | **0** | **0** | **0** | **Total cases in King Abdulaziz Hospital (KAAH)** |
| | **29** | **24** | **0** | **0** | **103** | **0** | **0** | **0** | **19** | **485** | **42** | **0** | **0** | **0** | 1 (JAN) |
| | **20** | **19** | **0** | **0** | **116** | **0** | **0** | **0** | **8** | **368** | **38** | **0** | **0** | **0** | 2 (FEB) |
| | **15** | **10** | **0** | **0** | **114** | **0** | **0** | **0** | **10** | **233** | **15** | **0** | **0** | **0** | 3 (MAR) |

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| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 13 | 0 | 0 | 73 | 0 | 0 | 0 | 8 | 183 | 12 | 0 | 0 | 0 | 4 (APRIL) |
| | 18 | 22 | 0 | 0 | 112 | 0 | 0 | 0 | 10 | 232 | 13 | 0 | 0 | 0 | 5 (MAY) |
| | 12 | 6 | 0 | 0 | 119 | 0 | 0 | 0 | 6 | 232 | 11 | 0 | 0 | 0 | 6 (JUN) |
| 15473 | 250 | 1905 | 1139 | 0 | 1378 | 482 | 2205 | 809 | 970 | 2080 | 1759 | 0 | 919 | 1577 | **Total cases in King Abdullah Medical City Hospital (KAMC)** |
| | 51 | 429 | 378 | 0 | 308 | 61 | 477 | 176 | 166 | 641 | 364 | 0 | 167 | 403 | 1 (JAN) |
| | 34 | 280 | 158 | 0 | 197 | 54 | 361 | 131 | 257 | 283 | 281 | 0 | 129 | 233 | 2 (FEB) |
| | 40 | 326 | 160 | 0 | 225 | 89 | 413 | 119 | 135 | 373 | 308 | 0 | 178 | 259 | 3 (MAR) |
| | 38 | 300 | 157 | 0 | 237 | 98 | 354 | 122 | 138 | 280 | 284 | 0 | 158 | 251 | 4 (APRIL) |
| | 51 | 329 | 176 | 0 | 234 | 103 | 350 | 148 | 153 | 282 | 302 | 0 | 158 | 250 | 5 (MAY) |
| | 36 | 241 | 110 | 0 | 177 | 77 | 250 | 113 | 121 | 221 | 220 | 0 | 129 | 181 | 6 (JUN) |
| 2030 | 0 | 106 | 54 | 0 | 1371 | 8 | 0 | 0 | 9 | 436 | 46 | 0 | 0 | 0 | **Total cases in King Faisal Hospital (KFH)** |
| | 0 | 49 | 23 | 0 | 352 | 4 | 0 | 0 | 1 | 166 | 24 | 0 | 0 | 0 | 1 (JAN) |
| | 0 | 24 | 12 | 0 | 251 | 0 | 0 | 0 | 0 | 102 | 8 | 0 | 0 | 0 | 2 (FEB) |
| | 0 | 13 | 4 | 0 | 215 | 1 | 0 | 0 | 1 | 19 | 0 | 0 | 0 | 0 | 3 (MAR) |
| | 0 | 11 | 5 | 0 | 243 | 0 | 0 | 0 | 1 | 44 | 3 | 0 | 0 | 0 | 4 (APRIL) |
| | 0 | 9 | 10 | 0 | 178 | 3 | 0 | 0 | 6 | 81 | 11 | 0 | 0 | 0 | 5 (MAY) |
| | 0 | 0 | 0 | 0 | 132 | 0 | 0 | 0 | 0 | 24 | 0 | 0 | 0 | 0 | 6 (JUN) |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **Total cases in Khulais Hospital** |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 (MAY) |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 (JUN) |
| 7908 | 0 | 1093 | 0 | 1448 | 0 | 0 | 0 | 2285 | 86 | 0 | 1936 | 894 | 166 | 0 | **Total cases in maternity& children Hospital (MCH)** |
| | 0 | 137 | 0 | 303 | 0 | 0 | 0 | 432 | 18 | 0 | 360 | 258 | 33 | 0 | 1 (JAN) |
| | 0 | 169 | 0 | 169 | 0 | 0 | 0 | 359 | 12 | 0 | 330 | 182 | 26 | 0 | 2 (FEB) |
| | 0 | 217 | 0 | 237 | 0 | 0 | 0 | 422 | 16 | 0 | 373 | 155 | 32 | 0 | 3 (MAR) |
| | 0 | 225 | 0 | 178 | 0 | 0 | 0 | 399 | 14 | 0 | 357 | 138 | 32 | 0 | 4 (APRIL) |
| | 0 | 220 | 0 | 336 | 0 | 0 | 0 | 409 | 18 | 0 | 335 | 122 | 28 | 0 | 5 (MAY) |
| | 0 | 125 | 0 | 225 | 0 | 0 | 0 | 264 | 8 | 0 | 181 | 39 | 15 | 0 | 6 (JUN) |

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| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **15471** | **131** | **1691** | **1234** | **0** | **1466** | **302** | **3076** | **0** | **521** | **1439** | **451** | **3004** | **44** | **2112** | **Total cases in Al-Noor specialist Hospital (NSH)** |
| | **23** | **282** | **175** | **0** | **228** | **84** | **423** | **0** | **89** | **269** | **56** | **444** | **10** | **418** | 1 (JAN) |
| | **24** | **243** | **156** | **0** | **210** | **69** | **393** | **0** | **68** | **219** | **62** | **406** | **8** | **347** | 2 (FEB) |
| | **15** | **282** | **182** | **0** | **223** | **40** | **480** | **0** | **77** | **184** | **75** | **472** | **8** | **340** | 3 (MAR) |
| | **20** | **301** | **208** | **0** | **251** | **44** | **597** | **0** | **82** | **212** | **93** | **551** | **8** | **357** | 4 (APRIL) |
| | **28** | **319** | **267** | **0** | **302** | **38** | **669** | **0** | **113** | **294** | **97** | **636** | **7** | **377** | 5 (MAY) |
| | **21** | **264** | **246** | **0** | **252** | **27** | **514** | **0** | **92** | **261** | **68** | **495** | **3** | **273** | 6 (JUN) |
| **54379.63** | **490** | **4889** | **2427** | **1448** | **4852** | **792** | **8079** | **5849** | **1647** | **8735** | **5948.48** | **4405.15** | **1129** | **3689** | **Grand Total** |
| | **P-Value by row = 0 %**<br>**P-Value by column = 0 %** | | | | | | | | | | | | | | |

| | **Pattern of Surgical Practice in MHCC Hospitals 2024** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Type of surgery performed** | | | | | | | | | | | | | | |
| **Total** | **Vascular Surgery** | **Urology** | **Plastic Surgery** | **Pediatrics Surgery** | **Orthopedics** | **Oral Surgery** | **Ophthalmology** | **Obstetrics** | **Neurosurgery** | **General Surgery** | **ENT** | **Dentistry** | **Cardiothoracic** | **Bariatric** | **Month/Hospital 2024** |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **Total cases in Alkamel hospital** |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 (JUN) |
| | 0 | 0 | 0 | 0 | 0 | 0 | 354 | 230 | 0 | 193 | 180 | 133 | 0 | 0 | **Total cases in Hera general hospital (HGH)** |
| | 0 | 0 | 0 | 0 | 0 | 0 | 45 | 57 | 0 | 51 | 34 | 30 | 0 | 0 | 1 (JAN) |
| | 0 | 0 | 0 | 0 | 0 | 0 | 54 | 38 | 0 | 38 | 29 | 20 | 0 | 0 | 2 (FEB) |
| | 0 | 0 | 0 | 0 | 0 | 0 | 47 | 27 | 0 | 32 | 25 | 16 | 0 | 0 | 3 (MAR) |
| | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 16 | 0 | 9 | 14 | 9 | 0 | 0 | 4 (APRIL) |
| | 0 | 0 | 0 | 0 | 0 | 0 | 89 | 36 | 0 | 34 | 30 | 22 | 0 | 0 | 5 (MAY) |
| | 0 | 0 | 0 | 0 | 0 | 0 | 87 | 56 | 0 | 29 | 48 | 36 | 0 | 0 | 6 (JUN) |
| 685 | 47 | 33 | 0 | 0 | 142 | 0 | 0 | 0 | 15 | 399 | 49 | 0 | 0 | 0 | **Total cases in King Abdulaziz Hospital (KAAH)** |
| | 12 | 10 | 0 | 0 | 35 | 0 | 0 | 0 | 5 | 125 | 13 | 0 | 0 | 0 | 1 (JAN) |
| | 12 | 5 | 0 | 0 | 19 | 0 | 0 | 0 | 4 | 110 | 17 | 0 | 0 | 0 | 2 (FEB) |
| | 9 | 8 | 0 | 0 | 28 | 0 | 0 | 0 | 1 | 38 | 8 | 0 | 0 | 0 | 3 (MAR) |
| | 7 | 1 | 0 | 0 | 23 | 0 | 0 | 0 | 1 | 34 | 3 | 0 | 0 | 0 | 4 (APRIL) |
| | 7 | 9 | 0 | 0 | 28 | 0 | 0 | 0 | 4 | 92 | 8 | 0 | 0 | 0 | 5 (MAY) |
| | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 (JUN) |
| 2704 | 46 | 251 | 128 | 0 | 186 | 44 | 520 | 82 | 96 | 649 | 222 | 0 | 256 | 224 | **Total cases in King Abdullah Medical City Hospital (KAMC)** |
| | 14 | 56 | 40 | 0 | 50 | 10 | 129 | 8 | 33 | 155 | 52 | 0 | 61 | 68 | 1 (JAN) |
| | 10 | 39 | 25 | 0 | 53 | 9 | 84 | 12 | 18 | 106 | 43 | 0 | 45 | 49 | 2 (FEB) |

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| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 6 | 39 | 8 | 0 | 19 | 6 | 77 | 16 | 10 | 131 | 41 | 0 | 42 | 16 | 3 (MAR) |
| | 5 | 30 | 19 | 0 | 20 | 3 | 44 | 12 | 5 | 74 | 20 | 0 | 32 | 31 | 4 (APRIL) |
| | 9 | 52 | 30 | 0 | 33 | 8 | 116 | 20 | 18 | 111 | 46 | 0 | 42 | 54 | 5 (MAY) |
| | 2 | 35 | 6 | 0 | 11 | 8 | 70 | 14 | 12 | 72 | 20 | 0 | 34 | 6 | 6 (JUN) |
| 434 | 0 | 27 | 11 | 0 | 57 | 12 | 0 | 0 | 8 | 288 | 31 | 0 | 0 | 0 | **Total cases in King Faisal Hospital (KFH)** |
| | 0 | 9 | 5 | 0 | 15 | 2 | 0 | 0 | 3 | 77 | 8 | 0 | 0 | 0 | 1 (JAN) |
| | 0 | 7 | 3 | 0 | 12 | 2 | 0 | 0 | 0 | 64 | 7 | 0 | 0 | 0 | 2 (FEB) |
| | 0 | 4 | 0 | 0 | 8 | 1 | 0 | 0 | 1 | 47 | 6 | 0 | 0 | 0 | 3 (MAR) |
| | 0 | 2 | 1 | 0 | 0 | 2 | 0 | 0 | 1 | 32 | 4 | 0 | 0 | 0 | 4 (APRIL) |
| | 0 | 4 | 2 | 0 | 21 | 3 | 0 | 0 | 3 | 56 | 6 | 0 | 0 | 0 | 5 (MAY) |
| | 0 | 1 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 12 | 0 | 0 | 0 | 0 | 6 (JUN) |
| 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | **Total cases in Khulais Hospital** |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 5 (MAY) |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 (JUN) |
| 2273 | 0 | 83 | 0 | 776 | 46 | 0 | 0 | 767 | 51 | 0 | 475 | 59 | 16 | 0 | **Total cases in maternity& children Hospital (MCH)** |
| | 0 | 14 | 0 | 153 | 46 | 0 | 0 | 136 | 31 | 0 | 52 | 5 | 6 | 0 | 1 (JAN) |
| | 0 | 11 | 0 | 143 | 0 | 0 | 0 | 138 | 5 | 0 | 39 | 5 | 2 | 0 | 2 (FEB) |
| | 0 | 10 | 0 | 140 | 0 | 0 | 0 | 110 | 4 | 0 | 39 | 9 | 0 | 0 | 3 (MAR) |
| | 0 | 9 | 0 | 77 | 0 | 0 | 0 | 100 | 1 | 0 | 35 | 4 | 0 | 0 | 4 (APRIL) |
| | 0 | 3 | 0 | 119 | 0 | 0 | 0 | 133 | 5 | 0 | 139 | 4 | 0 | 0 | 5 (MAY) |
| | 0 | 36 | 0 | 144 | 0 | 0 | 0 | 150 | 5 | 0 | 171 | 32 | 8 | 0 | 6 (JUN) |
| 1688 | 8 | 72 | 110 | 0 | 182 | 18 | 518 | 0 | 32 | 219 | 136 | 204 | 6 | 183 | **Total cases in Al-Noor specialist Hospital (NSH)** |
| | 2 | 21 | 42 | 0 | 63 | 5 | 140 | 0 | 11 | 77 | 30 | 57 | 2 | 57 | 1 (JAN) |
| | 2 | 21 | 30 | 0 | 47 | 2 | 102 | 0 | 8 | 55 | 25 | 37 | 2 | 41 | 2 (FEB) |
| | 0 | 3 | 3 | 0 | 11 | 3 | 63 | 0 | 1 | 20 | 16 | 15 | 0 | 14 | 3 (MAR) |
| | 2 | 5 | 9 | 0 | 18 | 3 | 42 | 0 | 4 | 22 | 10 | 21 | 0 | 20 | 4 (APRIL) |
| | 2 | 22 | 26 | 0 | 43 | 5 | 105 | 0 | 8 | 42 | 22 | 41 | 2 | 51 | 5 (MAY) |
| | 0 | 0 | 0 | 0 | 0 | 0 | 66 | 0 | 0 | 3 | 33 | 33 | 0 | 0 | 6 (JUN) |
| 8879 | 101 | 466 | 249 | 776 | 613 | 74 | 1392 | 1079 | 202 | 1753 | 1093 | 396 | 278 | 407 | **Grand Total** |
| | **P-Value by row = 0%**<br>**P-Value by column = 0%** | | | | | | | | | | | | | | |

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| Comparing Pattern of Surgical Practice in MHCC Hospitals 2024 before and during Hajj | | |
|---|---|---|
| Regular Pattern (from 1-02-2024 till 30-04-2024) | Pattern during Hajj season 2024 (from 1-05-2024 till 31-07-2024). | Type of practice |
| **P-Value =** 20% | | OR Utilization |
| P-Value = 8% | | Surgical Cancellation Rate |
| P-Value = 21% | | Elective Surgeries (%) |
| P-Value = 4.9% | | Elective Surgery Volume |
| P-Value = 0% | | Emergency Surgeries % |
| P-Value = 21% | | Emergency Surgeries Volume |
| P-Value = 29% | | Day of admission to day of Surgery |
| P-Value = 2% | | Day Surgery (percent) |
| P-Value = 7% | | Unplanned Admission Following Discharge |
| P-Value = 17% | | Day Surgery Cancellation Rate |
| P-Value = 2% | | Day Surgery Conversion to Admission |
| P-Value = 34% | | Waiting List Bariatric |
| P-Value = 41% | | Waiting List Cardiothoracic |
| P-Value = 43% | | Waiting List Dentistry |
| P-Value = 48% | | Waiting List ENT |
| P-Value = 10% | | Waiting List General Surgery |
| P-Value = 35% | | Waiting List Neurosurgery |
| P-Value = 50% | | Waiting List Obstetrics |
| P-Value = 48% | | Waiting List Ophthalmology |
| P-Value =45% | | Waiting List Oral Surgery |
| P-Value = 39% | | Waiting List Orthopedics' |
| P-Value = 41% | | Waiting List Pediatrics Surgery |
| P-Value = 46% | | Waiting List Plastic Surgery |
| P-Value = 46% | | Waiting List Urology |
| P-Value = 45% | | Waiting List Vascular Surgery |
| P-Value = 13% | | Surgeries Performed Bariatric |
| P-Value = 24% | | Surgeries Performed Cardiothoracic |
| P-Value = 35% | | Surgeries Performed Dentistry |
| P-Value = 0.039% | | Surgeries Performed ENT |
| P-Value = 0.0004% | | Surgeries Performed General Surgery |
| P-Value = 0.04% | | Surgeries Performed Neuro Surgery |
| P-Value = 44% | | Surgeries Performed Obsterics |
| P-Value = 37% | | Surgeries Performed Opthalmology |
| P-Value = 43% | | Surgeries Performed Oral Surgery |
| P-Value = 0.006% | | Surgeries Performed Orthopedics |
| P-Value = 32% | | Surgeries Performed Pediatrics |
| P-Value = 9% | | Surgeries Performed Plastic Surgery |
| P-Value = 27% | | Surgeries Performed Urology |
| P-Value = 0.025% | | Surgeries Performed Vascular Surgery |

## 5. Discussion

The current study shows that there was Statistically significant differences between Operation Room (OR) Surgical Cancellation Rate and Operation Room (OR) Utilization Rate between different MHCC hospitals P-Value = 1% as well as Statistically significant differences between Operation Room (OR) Surgical Cancellation Rate and Operation Room (OR) Utilization Rate between MHCC hospitals P-Value = 1%, on the other hand, no Statistically significant differences noted between Operation

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Room (OR) Surgical Cancellation Rate and Day Surgery Cancellation Rate among MHCC hospitals P-Value = 7%

Since the highest hospital in the operation room utilization rate was King Abdulaziz Hospital 86.755%, And the lowest was Al-kamel Hospital 0 %. Furthermore, the highest hospital in OR surgical cancellation rate was Al-Noor Specialist Hospital 3.07% and the lowest was Al-Kamel Hospital 0 %.

The operational room utilization rate in the current study was within the range of most published international studies. The international average of the operational room utilization rate range from 75% to 90%. [22] If it is more than 90% , then it can decrease the waiting list of patient.[22]

OR surgical cancellation ratein the current study 5.53% was within the range of most published international studies The average **cancellation rates** in international studied on the day of **surgery** was between 0.8% and 6.4%[22] and **cancellation rate** of less than 5% was considered efficient [23]

No Statistically significant differences between Elective Surgeries and Emergency Surgeries are noted between different MHCC hospitals P = 14%

The highest rate of elective surgeries was in King Abdullah medical city 2717 cases and the lowest was Al-Kamel Hospital 0 %. Compared to the emergency surgeries in which Al-Noor specialist hospital have the higher number of cases 2725 and the lowest was Al-Kamel Hospital 0 % This result could be due to that King Abdullah Medical City is tertiary hospital in which more elective surgery is done. Compared to other hospitals in which usually the emergencies surgeries were done more than elective ones which indicate the good quality of surgical care for patients especially in Al-Noor Specialist Hospital

The Ee ratio as a new metric for access to surgical care and demonstrates that it correlates with per capita healthcare spending. This confirms its use as an indicator of healthcare systems investment. The Ee ratio is easily applied in assessing surgical services at the local, regional, national, and international level and can be used to compare health systems at these levels. The Ee ratio is novel in its applicability to all patient populations, and its reflection of patients' ability to access needed surgical care in a timely fashion. Ee ratio is not only a direct measure of access to care but also an indirect indicator of anticipated perioperative mortality risk.. A retrospective analysis of 298,772 patients from the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) demonstrated that emergency status conveyed an adjusted odds ratio (OR) for mortality of 2.54 (p\0.001) [24]

Similarly, an analysis of almost 3 million surgical cases performed in the United absence of prepared staff and equipment. In this capacity, Ee ratio serves as a metric for surgical safety at the population and healthcare system level[24]

The ratio of emergent surgery to elective surgery (Ee ratio) in the current study was 79.64%, which is higher than international standards. There is significant worldwide variation in the Ee ratio, with particularly large differences between high-income and low-income countries. This is consistent with the fact that low-income nations carry a disproportionate share of the global burden of surgical illness and are unable to invest in improving surgical services. However, given the heterogeneity of these data, it is not obvious what Ee ratio may be considered an acceptable goal. The ultimate objective of the Ee ratio is not to determine a universal standard but rather to set a benchmark across a national health system that reflects not the exact volume or case mix, but rather the way in which a system can provide care as a whole. Emergency surgery is not completely avoidable, and every system must include surge capacity to accommodate for trauma, violence, and natural disasters. These data demonstrate a global median Ee ratio of 14.6, while in high-income nations of North American and Europe the median Ee ratios is 9.4 and 5.5, respectively. The MSF data provide useful context for an Ee ratio in a region with active conflict and complete reliance on external aid: 557.4. The ideal Ee ratio is likely close to 5.5, that achieved by European countries, but this may be unattainable for low-resource healthcare systems disproportionately affected by high disease burden and low provider density. investments in healthcare plan are recommended with the goal of reducing their Ee ratio[24]

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The current study shows Statistically significant differences between Unplanned Admission Following Discharge and Day Surgery Conversion to Admission among different MHCC hospitals P-Value = 1% compared to non-Statistically significant differences found between Day of admission to day of Surgery (percent) and Day Surgery (percent) noted between different MHCC hospitals P-Value = 8%, **Day of surgery admission** refers to the practice of admitting patients for elective surgery on the same day as their procedure, rather than having them stay in the hospital overnight.[25,26]

Several studies have sought to identify risk factors for and characterize outcomes of patients who convert from outpatient surgery to an inpatient hospital stay. Conversion rates are estimated to be between 0% and 28% but most commonly reported between 1% and 6%.[25,26] which was comparable to the result of the current study 0.64%

The current study shows no statistically significant differences between Day of admission to day of Surgery (percent) and Day Surgery (percent) noted between different MHCC hospitals P-Value = 8%, . Being that. The highest hospital for a day of admission to day of surgery was King Abdulaziz Hospital 44% and lowest was Al-Kamel Hospital 0 %. This difference could be due to the high quality of surgical practice and some hospital compared to others So those who did the day surgery, they didn't admit them. This difference in day of admission to day of surgery could be due to the high quality of surgical practice. Since the NHS Modernization Agency recommends **75**% of all surgical procedures performed in a hospital within a day.[27] The highest hospital in day surgery was King Faisal Hospital 17.47 %. and lowest was Al-Kamel Hospital 0 %.

Internationally, patients' admission rate after a planned day surgery was found at 1.5%.which was comparable to the result of the current study[25,26] An unplanned admission following discharge refers to a situation where a patient has been discharged from the hospital (referred to as the “index admission”) and then experiences an unexpected subsequent admission related to the initial hospital stay. These readmissions are potentially preventable and can occur within a short timeframe (often within 72 hours) after the original discharge [28]

Surgical cancelation rate between 1% and 14% is generally reported and accepted.which was comparable to the result of the current study 4.14% In Surgical Directions’ experience, a cancellation rate exceeding 1% for day surgery is a direct indication that a hospital’s scheduling and preparation process needs in-depth review and restructuring.[29]

There is a statistically significant difference between surgery waiting lists for different specialties P = 0% as well as between surgery waiting lists and different MHCC hospitals P = 0%, being that the highest waiting list was for general surgery (8735 cases) and the lowest was vascular surgery waiting list (490 cases) and the highest waiting list was in KAMC (15473 cases) followed by Al-Noor Specialist hospital (15471 cases) and the lowest was in Al-Kamel Hospital (0 cases). This could be due to more surgical subspecialities, shortage of manpower in some hospitals compared to others.

The waiting time for surgeries in the current study is high compared to other international studies. Whilst patients waiting time for surgery guarantees range between 3 and 6 months in the UK [30,31], the Dutch government, following a joint proposal of several medical organizations, set the maximum waiting time target for hospital treatment to 7 weeks, whereas 80% of the patients should be treated within 5 weeks [32]. These apparent differences in waiting time cut-off point, signify that most cut-off points are set fairly arbitrarily and it raises the question which waiting time thresholds would signify timely access to care and could from that viewpoint be deemed acceptable.[32]

There is a statistically significant difference between type of surgery performed for different specialties P = 0 % as well as between type of surgery performed and different MHCC hospitals P = 0%. General surgeries operations are the most common type of operation done in MHCC (1753 cases) compared to the oral surgery which was the lowest type of surgical operation performed (74 cases). KAMC was the highest hospital in surgery performance (2704 cases) followed by maternal and children hospital (2273 cases). This could be due to more surgical subspecialities, shortage of manpower in some hospitals compared to others.

There is a statistically significant difference among Elective Surgeries performed regularly before Hajj compared to such practice during Hajj season P=0.049 as well as for Emergency Surgeries

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P=0.002, Day Surgery P=0.02, Day Surgery Conversion to Admission P=0.02, Vascular Surgery P=0.025, Orthopedics P=0.006, Neuro Surgery P=0.04, General Surgery P=0.0004 and Ear-Nose-Throat (ENT) P=0.039.

This aspect of a statistically significant difference before and during Hajj seem to need special interventions in order to shorten that gap

These differences could be due to large influx of pilgrims during Hajj season comparing to the available resources including, hospitals, materials, machines and manpower.

These significant differences may be due to the high number of elderly people with chronic diseases among the pilgrims

A study conducted in the ICU reported that 37.3% of cases admitted to ICU were pilgrims who were critically ill due to cardiovascular diseases (23.6% with myocardial infarction) [1]

Therefore, pre-Hajj functional assessment should be carried out to identify pilgrims patients at a high risk of surgery

## 6. Conclusion & Recommendation:

Approaches to improving the surgical and O.R practice in MHCC hospitals can occur on many levels based on the required level of resources and institutional support.

Data transparency and communication are critical to improvements, and any intervention should be conducted in the context of overall patient care, especially during Hajj Seasons. Such interventions may include the improvements the quantities and quality of that practice as well as improving the equity and equality distribution of surgical and O.R manpower, materials, machines in order to shortening the O.R waiting list, surgery cancelation rates and improve the O.R utilization rates; in order to attain the goals of value-based health care and new model of care.

To measure operating room (OR) performance and efficiency, hospitals need scorecards or dashboards displaying and tracking core performance indicators. Scorecards should be monitored on an ongoing basis and benchmarked both internally against performance over time and externally against established best practices with the intent of continuous performance improvement.

Among the lessons learned from current study, the need for large-scale scientific studies including qualitative and quantitative ones to quantify the factors related to surgical and OR practice.

Different type of surgery represents a threat in the light of the expected increasing number of pilgrims after the completion of construction in the Grand Mosque and al-Mashaeer areas of the Hajj.

The vast development in surgery problem surveillance after the development of the web-based healthcare network is a welcome achievement of the Saudi Ministry of Health. The optimal utilization of the collected data is yet to be achieved.

The existing international collaboration needs to be strengthened and expanded.

Application of a new metric for surgical care access and delivery, the ratio of emergent surgery to elective surgery (Ee ratio) is essential

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