

**Mohammad Sharif Oria** , **Fahima Negin** , **Mohammad Faid Rassuli** ,  
**Hashmatullah Rahimi** , **Sheba Azim\*** , **Omran Omar Amarkhil** ,  
**Mohammad Ismael Ibrahim** , **Mohammad Monir Kamran** 

Kabul University of Medical Sciences, Kabul, Afghanistan

\*e-mail: Sheba2.azim@gmail.com

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## **DURING THE FIRST WAVE OF COVID-19 PANDEMIC, TRAUMA WAS THE FIRST LEADING CAUSE OF PERIOPERATIVE MORTALITIES IN ALIABAD TEACHING HOSPITAL**

Perioperative mortality rate is defined as number of deaths following anesthesia and surgery occurring either in the operating theater or within 7 days after surgery. This research seeks to determine perioperative mortality rate in the surgical wards of Aliabad Teaching Hospital, Kabul, Afghanistan.

The cross-sectional study was conducted after obtaining the ethical approval from Scientific Research Center review committee in Aliabad Teaching Hospital from March 2020 to March 2021. Patient data were collected from medical archive. Anesthesia and surgical log books were also used for collection of the data. Data were initially entered into an excel data sheet, and then exported to SPSS Statistics version 24 for further analysis. From the overall 1832 participants, 1050 were males and 782 females. 60.97 % of the patients had received general anaesthesia. Both elective and emergency procedures were included in the study. 37.9 % of the patients had systemic diseases. The perioperative mortality rate was found to be 3 % among the study participants. Trauma was the first significant reason of mortalities in the study. Majority of the mortalities have occurred in patients undergoing general anesthesia, being a young adults and emergency procedures. Female participants and those with systemic disease had higher risks of perioperative mortality.

**Key words:** Trauma, Non-communicable diseases, Perioperative mortality, Covid-19, General Anesthesia.

### **Introduction**

The first cases of COVID-19 were reported in the Wuhan city of Hubei Province in central China on December 29, 2019 as pneumonia of unknown cause. Subsequently, the World Health Organization (WHO) declared COVID-19 as a global pandemic on March 12, 2020. The first case of COVID-19 in Afghanistan was reported in the western province of Herat in a 35-year-old Afghan retailer who had returned from Qom city in Iran on Feb 9, 2020[1].

Disease Control Priorities 3 (DCP3) and the Lancet Commission on Global Surgery have put in order of importance indispensable surgery for low income countries (LICs) and low- and middle-income countries (LMICs) [2]. The indispensable surgery amount of DCP3 supports 44 cost-effective surgical interventions and vital anesthesia capacity for every first Referral Hospital in low- and middle-income countries. Performance of these suggestions together with the persistent providing of emergency surgery and anesthesia is supposed to affect 28% of the global burden of disease counting 25% of trauma and 35% of obstetric burdens [3].

Additionally, as non-communicable diseases including trauma and cancer as a result of inadequacy of surgery increasingly contribute to surgical burden, the absence of surgery and safe anesthesia in LMICs is increased. Trauma, a main cause of death in LMICs, depends on surgical interference to avoid disability and mortality. The morbidity and mortality from road traffic injuries accounts for 1.24 million deaths every year, and of every 20 injured people in traffic accidents, one dies [4]. LMICs report an annual injury death rate of 89 per 100,000, while high-income countries report only 51 per 100,000 [5]. There are two million potentially avoidable deaths among the 5 million annual deaths due to injury and many more among the growing burden of non-communicable diseases such as cardiovascular disease, diabetes and cancer [2,6]. If the anesthesia associated mortality rate is about 1:500 in developing countries and half of the deaths were avoidable, we estimate each year there are 35000 avoidable anesthetic deaths among 35 million operations in LMICs [6].

Perioperative mortality rate (POMR) is defined as death following surgery and anesthesia on the day of surgery, including death in the operating theatre and

before discharge from hospital or within 7 days from surgery. This definition of perioperative mortality has been proposed by the Safe Surgery Saves Lives initiatives of WHO’s Patient Safety Program [7].

This study seeks to determine POMR in Aliabad Teaching Hospital (ATH) in a retrospective way for 12 months, i.e. March 2020 – March 2021.

**Materials and Methods**

This is a cross sectional study which is modelled after an issued research clarification by K.A. Kelly McQueen at The Vanderbilt Department of Anesthesiology for 2018-2020. The research was conducted in ATH, Kabul University of Medical Sciences (KUMS), from March 2020 – March 2021. Patients’ perioperative data were collected from the medical achieve of ATH. Before collecting data and logbooks from ATH, theatres and medical archive permission was taken from relevant committee by anesthesiology faculty. The department of anesthesiology at KUMS consists of 7 faculties at 5 hospitals, including ATH, their major teaching hospital. ATH is reconstructed as a complex hospital in 2010 having general surgery, urology, orthopedics, neurosurgery, internal medicine, neuropsychology departments in its campus.

In addition, before conducting the study, ethical approval was obtained from Scientific Research Center of KUMS review committee.

All patients above 17 years’ old who had a procedure at ATH during one year (March 2020 –

March 2021) were included in the study. Patients who went to the operating theatre for operation but the operation was not conducted due to any reason, and patients who were operated at another institution and then transferred to ATH were excluded from the study.

The study team collected the required data first by going through logbooks and then using patient charts collected from medical records. Anesthesia and surgical operating theatre logbooks were also examined to collect data. Data elements potentially available from logbooks were registration number, age, gender, date of operation, post-operative diagnosis, type of operation, systematic diseases of the patients, and urgency of operation. To follow up on disposition of these patients, the logbooks from the post-anesthesia care unit and all relevant wards were also examined.

All data with complete information were checked regularly to rectify any discrepancy, logical errors, and missing values. Initial data was entered into excel data sheet and then exported to SPSS Statistics version 24 for further analysis. Bi-variable analysis was used to determine factors which are associated with stress level. A p-value of <0.05 was set as significance level at 95% confidence interval.

**Results**

The following diagram shows the flow of subject participation for the study.

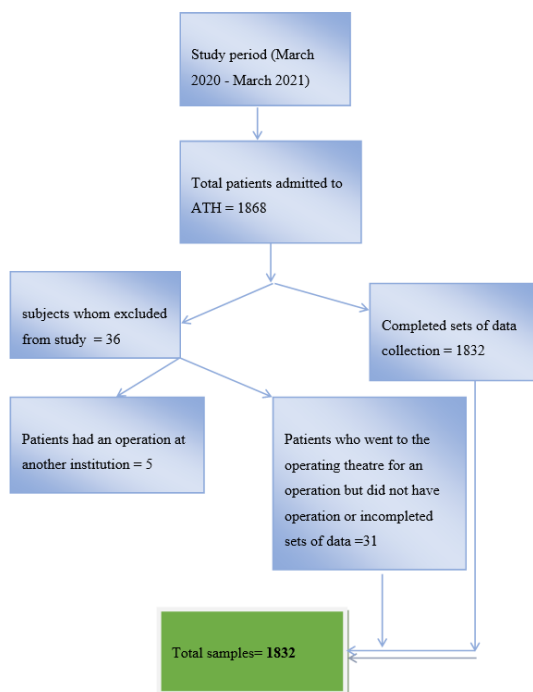


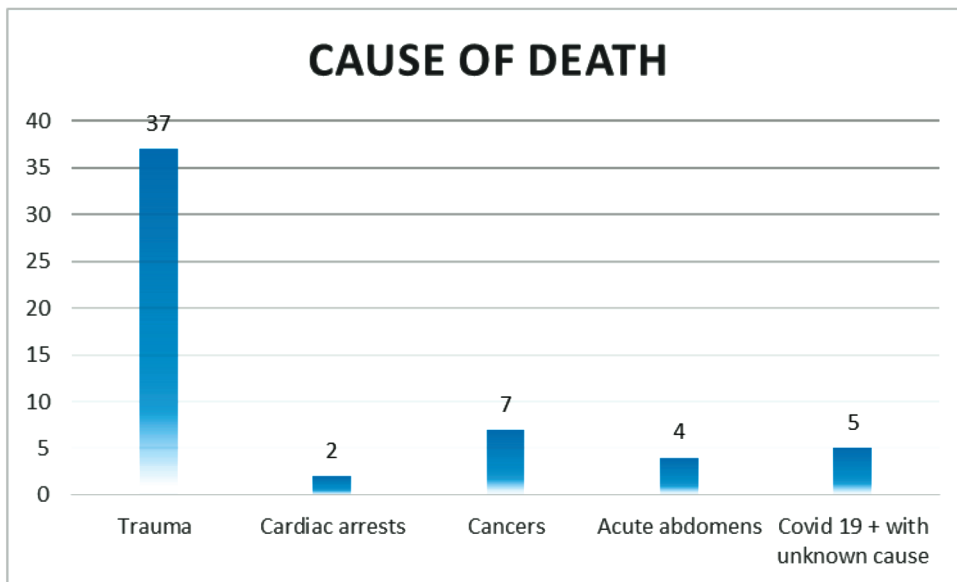
Figure 1 – Flow diagram of data collection

As shown in Figure 1, From March 2020 – March 2021, a total of 1868 patients met the circumstances admitted to ATH in the existing study. 1832 data collection sheets were completed. 36 patients were eliminated from consideration because incomplete data. From a total of 1832 patients, 1050 were males and 782 were females. The mean age of the subjects was  $39.16 \pm 16.995$  years. Majority of the patients (44.1%) admitted to the general surgery ward of the ATH. Most of the patients lived in Kabul.

From the overall 1832 participants, as specified in table 1 characteristics of the subjects, 60.97 % patients received to the general anesthesia. Urgency of procedures was considered as a variable, both elective and emergency procedures was included in the study. In addition, 37.9 % of the patients had Systemic disease or worse physical condition according to American Society of Anesthesiologists (ASA) physical status. The perioperative mortality rate was detected to be 3 % among the study participants.

**Table 1** – Characteristics of the subjects (n=1832)

Characteristics	Classification	n (%)
Gender	Female	782 (42.68)
	Male	1050 (57.31)
Age group	<30	876 (47.81)
	=>30	956 (52.18)
Urgency of procedures	Emergency	562 (30.73)
	Elective	1270 (69.26)
Systemic disease patients	Present	697 (37.99)
	Absent	1135 (62.00)
Anesthesia type	General anesthesia	1117 (60.97)
	Spinal anesthesia	661 (36.02)
	Local anesthesia	54 (3.0)



**Figure 2** – The causes of perioperative mortality

Figure 2 shows the causes of perioperative deaths occurring during study period in to surgical wards of ATH. As shown, most deaths (67.2%) were caused by trauma, followed by cancers (12.7%), COVID 19 infection (9 %), acute abdomens (7.2 %) and cardiac arrest (3.6%) – bearing in mind that it was unknown

whether patients who died of the non-covid causes were infected by COVID-19 or not.

Table 2 shows the characteristics of the subjects which had significant association with perioperative mortality. Female participants had more risk of perioperative mortality compared to male participants,

with odds ratio of 1.2 and its corresponding 95% confidence interval (0.7- 2.1) in this study, but this did not reach statistical significance (p-value = 0.484). Patients with age category of 17-29 years old had increased risk of perioperative mortality, as compare to those more than 29 years of age years old, with odds ratio of 2.3 and its correspondent 95% confidence interval (1.3-4.2). Emergency procedures had increased risk of perioperative mortality, as

compare to those lower than elective procedures, with odds ratio of 8.7 and its correspondent 95% confidence interval (4.5-16.6). Systemic disease of the patients had not showed statistical significance (p-value = 0.385). Furthermore, Patients whom received general anesthesia was associated with an increased risk for perioperative mortality, as compare to loco regional anesthesia, with odds ratio of 3.9 and its correspondent 95% confidence interval (1.8-8.3).

**Table 2** – Results of Chi-square analysis for factors associated with perioperative mortality

Factors		Deaths		OR <sub>c</sub> ** (95 % CI)	p-value
		Yes n (%)	No n (%)		
Gender of the patients	Female	26 (3.32)	756 (96.67)	1.2 (0.7-2.1)	0.484
	Male	29 (2.76)	1021 (97.23)		
Age groups of the patients	<30	37 (4.22)	839 (95.77)	2.3 (1.3-4.2)	0.003
	=>30	18 (1.88)	938 (98.11)		
Urgency of procedures in the patients	Emergency	43 (7.65)	519 (92.34)	8.7 (4.5-16.6)	0.000
	Elective	12 (0.94)	1258 (99.05)		
Systemic disease of the patients	Absent	31 (2.73)	1104(97.26)	1.3 (0.7-2.2 )	0.385
	Present	24(3.44)	673(96.56)		
Anesthesia type of the patients	General anesthesia	47 (4.20)	1070 (95.79)	3.9 (1.8-8.3 )	0.001*
	Loco regional anesthesia	8 (1.11)	707 (98.88)		

\* Fisher’s exact test

\*\*Crude odds ratio

## Discussion

Since the number of procedures performed must be identified to calculate it, perioperative mortality is not a degree of access. The inaccessibility to safe surgery and anesthesia will result in delayed processes, which associates with both a higher mortality rate and fewer procedures. A system in which safety and accessibility are not achieved will have a higher mortality rate and fewer procedures per head of population [8].

The perioperative mortality rate among the study population, i.e., 1832, was found 3%. This is approximately in line with the study conducted by F. Tarekegn et al., [9], lower than study carried out by Maman AFO B et al., [10] and by Tomta K et al., [11]. Whereas, Tyson AF et al., [12] reported 2.5%, which is lower than our findings. Nonetheless, our investigation which was conducted in Aliabad Teaching Hospital in 2020 revealed a higher rate of mortality, 4.3% [13].

During the first wave of COVID-19 pandemic, Lei and colleagues [14] reported the overall hospital mortality following selective surgeries during the

incubation period of COVID-19 as 20.5%, which is considerably higher than our study. One possible reason for this remarkable difference is absence of vivid protocols for carrying out surgical procedures at the time in low-income countries. During the first surge of Covid-19 pandemic, most surgeons encountered a major problem – they had difficulty deciding whether to perform selective surgeries or postpone them. Similarly, majority of the patients were reluctant to get surgical treatment back then because they were worrying about contracting COVID-19 during their hospital stay [15]. Other possible explanations might have been social stigma, stress and concerns about spreading of the disease in their nation state. In general, when stress exceeds, the body has difficulties adapting or coping with it, both physically and psychologically, the harmful effects of stress arise. In these cases, stress has a role in the development of a variety of health and psychological problems [16].

This study found trauma; including various forms such as fall down, head trauma, road traffic accident, spine trauma, poly trauma and combined forms; the foremost cause of perioperative mortalities. This

figure is identical to what Cherian, M. et al., and Taira et al., [4,5] have reported in their studies. It may strongly depend on the supposition that mortality trends in poor countries will have a connection with socio-economic development similar to those having been noticed in higher-income countries. Morbidity and mortality from road traffic injuries accounts for 1.24 million deaths annually, and one out of every 20 injured patients in traffic accidents dies [4].

The study findings concerning mortalities caused by cardiac arrest (0.8%) are higher than what Sprung J et al., [17] have reported. Cardiac arrests have been reported to be mostly attributable to anesthesia. One of the possible reasons for the higher mortalities caused by cardiac arrest might be scarcity of anesthesiologists. Shortage of anesthesiologists is demonstrated in Afghanistan (9 anesthesiologists per 32 million population), Uganda [13] anesthesiologists per 27 million population), and Rwanda (9 anesthesiologists per 10 million population) [4,18]. Moreover, due to limited financial and logistic resources, anesthesiologists are bound to administer the same anesthetic agents for all patients irrespective of type of surgical procedures, which may sometimes elevate anesthetic-related morbidity and mortality and adversely affect surgical outcome [19].

Unfortunately, anesthesia is still a cause of most preventable morbidities and mortalities [20]. Countries in Africa and other LMIC's have been surveyed in terms of access to surgical and anesthesia care, and weaknesses in surgery and anesthesia infrastructure have been identified [21,22].

In Afghanistan, in most cases, anesthesia is performed by practitioners having earned Bachelor of Science in Anesthesia Technology Program. The program is designed for four years, and is supervised by faculties of the Anesthesiology Department at Kabul University of Medical Sciences. Some of these practitioners have completed a five-year residency program in anesthesiology [23].

In terms of age, a higher perioperative mortality rate is identified among 17- 29 age category, showing a precise similarity to WHO injuries and violence evidence. This probably correlates with the fact that people in this age category are more prone to injuries and violence than greater age categories [24].

There was a higher risk of perioperative mortality rates among females compared to males, which is in contrast with the studies conducted by Richard L et al., [25] and Braz LG, et al.[20]. This can be described by the statement that, both male and female participants are more susceptible to trauma, violence, and bomb blast attacks. Likewise, Oria et al. [13] study findings in Aliabad teaching hospital two years ago are in contrast to the current study.

Urgency of procedures was recognized to have significant association with perioperative mortality using Chi-square analyses. Emergency procedures were associated with higher perioperative mortality in our study. Braz LG, et al., and Newland MC, et al., had also reported that emergency procedures have been associated with higher risks of perioperative mortality [26].

More than a quarter of the interventions in this study were urgent cases. This is in contrast with Notrica M, et al., and Linden et al., studies outcome concerning urgency of procedures, where they reported that more than half of all surgeries were urgent interventions [18,27].

Chi-square analysis revealed that there were higher risks of perioperative mortality with general anesthesia as compared to those undergoing locoregional anesthesia. Arbous et al., Lienhart A, et al., and Braz LG, et al., had reported similarly[20,25,28]. Our findings have not shown any significant difference among patients with systemic diseases. However, Braz et al., in 2009 and A systematic review of observational studies by the same authors in 2020 evidently stated that, systematic diseases are risk factors for perioperative mortality [20,29].

Furthermore, a cohort study in 2019 concluded that mortality and complications rate was higher in COVID-19 positive patients than in those who were not infected by the pandemic [30].

## Conclusion

The perioperative mortality rate was found 3%. Trauma was the important cause in perioperative mortalities. Majority of the mortalities have occurred in patients undergoing general anesthesia, being a young adult and emergency procedures.

Inadequacy of emergency services, surgical services, safe anesthesia infrastructure and number of anesthesiologists might have affected the perioperative mortality rate in Aliabad teaching hospital; therefore, the followings are recommended, which may help the mortality rates decline dramatically.

1. Creating a sophisticated data base (similar to HMIS) system at hospital.
2. Establishing a standard and well-equipped ICU for the purpose of better patient care and post-operative follow up of the patients.
3. Providing training and capacity building programs for hospital staff.
4. Promoting the implementation of best practices, such as WHO guidelines for safe surgery and other procedure-specific or context specific

evidence to decrease the complications. Developing a local culture of safety with regular quality of care discussions.

5. Developing quality improvement networks across settings to work collectively to identify and

implement strategies to improve safety and decrease perioperative mortality rate (POMR).

6. Investing in the technology and human resources required for the prospective collection and analysis of POMR data.

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