CANCELLATION OF ELECTIVE SURGERY AND ITS ASSOCIATED FACTORS IN PUBLIC TEACHING HOSPITAL OF ADDIS ABABA, ETHIOPIA,2021

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Abbreviations and acronyms

CC- Case cancellation

CR - Cancelation rate

CTVS- Cardiovascular and Thoracic Surgery

DM - Diabetes Mellitus

DOS- Day of surgery

ENT –Ear-Nose-Throat

GS -General surgery

ICU - Intensive Care Unit

IRB - Institutional review board

NHS- National Health System

Oby/Gyn- obstetrics and Gynecology

OR - Operation Room

OT- Operating Theater

PRE-OP- Preoperative Care

SPHMMC- St. Paul's Hospital Millennium Medical College

SPSS-Statistical package for the social science

TASH-Tikur Anbesa Specialized Hospital

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ABSTRACT

Introduction Elective surgical case cancellation is common and can have significant adverse effects and causes prolonged waiting times, harm to patients, and are a waste of scarce resources in countries like Ethiopia. Cancellation of scheduled surgery leads to operating theatre under-occupancy and is recognized as a major cause of emotional trauma to patients and their families. Reason for elective surgery cancellation is complex and different from hospital to hospital many literatures agree with patient related, facility related, medical related and staff related others divide reason in to two avoidable and non-avoidable causes.

Objectives: The aim of this study was to assess prevalence of cancelation of elective surgical operations and associated factors at public teaching hospitals of Addis Ababa, Ethiopia, 2021.

Method: This was institutional based cross-sectional study conducted in all operation theater specialties from February 1-March 30/2021 at TASH and Yekatite 12 hospital. The study subjects were all patients, of all ages and both genders who were scheduled for elective surgery. Data were collected by using pretested structured questionnaires and an assigned OR staff was recording the cancelled cases in real time. Data was entered in to SPSS version 25 for analysis and the result of study was explained by narratives, tables and graphs

Result: For the given study period, 924 elective surgeries were scheduled to be performed in all surgery department at TASH and Yekatite 12 hospital, of which 225 (24.35%) were cancelled on the day of surgery. The average age was 35.2 ± 19.17(SD) years the main reason for cancellation were shortage of time 26% followed by facility related 23%, medical related 18% and covid 19 related problems 15%**.**

Conclusion and recommendation: This study found out that the cancelation of elective surgical operation on the scheduled day of surgery was very significant. Most of the reasons were supposed to be avoidable. A team approach ensuring presence of polices and procedure for improving OR efficiency and scheduling realistic operation list.

Keywords: Elective surgery, Cancelation, Day of surgery, Operation Theater

1. INTRODUCTION

1.1 Background

Elective surgical case cancellation refers to any surgical case that is booked into the operation theatre list on the day prior to surgery, but is not operated upon as scheduled. Cancellation of elective operations is a parameter to assess quality of patient care and quality of management system. The reported incidence of cancellation in different hospitals ranges from 10% to 40%. There are many reasons of cancellation of elective surgical cases; and they differ from hospital to hospital (1,2). The cancellation of surgery is a significance drain on health resources therefore, major hospitals invest considerable resource in maintaining operating room (OR)(3). The higher rates of cancellation in academic institutions are of special interest, Often it is claimed that the unpredictability of maximum care leads to case cancellation (4). Operation theatre generates a substantial part of the hospital revenue. For a hospital, the operating theatre accounts for more than 40% of its revenues and also it need high costs to maintain the service (5).

There are numerous reasons for cancellations of elective surgical cases these are patient-related factors which includes inadequate preoperative preparation of the patient, a change in the medical condition of the patient right before the surgical procedure or the patient decides not to undergo surgery. Surgeon-related factors such as inadequate interpretation of indications and inadequate scheduling of the surgical procedure surgeons are not available. Facility related factors are emergency procedures which interfere with the regular operating schedule, lack of space and time to perform surgery or shortage of staff and materials necessary for the surgical procedure (6,7).

Unexpected operating room cancellations are traditionally divided into avoidable cancellations (e.g., scheduling errors, equipment shortages, and cancellation due to inadequate preoperative evaluation) and unavoidable cancellations (e.g., emergency case superseding the elective schedule, unexpected changes in the patient's medical status, or patient nonappearance). And the most common factor which has led to cancellation is lack of OR time (8).

Last minute cancellations result in inefficient use of resources, not in the interests of the patient or the hospital, and result in lost capacity and a substantial amount of work were done after admission of the patient still surgery with multidisciplinary team (9). A pre-surgical anesthetic evaluation to assess patient's fitness for surgery is not usually performed before the operation unless requested by the senior surgery consultant a day before surgery (10).

Cancellation of elective surgical procedure is a well-recognized problem in perioperative care and one of the nursing sensitive quality indicators in perioperative care. Cancellation of elective operation decrease the over-all efficiency of the operating rooms(ORs), reduces utilization of OR time and waste resources (11). Unanticipated cancellation of planned operations results in distortion and alteration of surgical list, underutilization of man power wastage of scarce resource duplication of workload wastage of operating room time (12–14). Cancellation burden on patients' and families are significance emotional trauma, anxiety, expend extra cost due to long hospital stay and poor satisfaction, disruption of daily life and interruption of patient-hospital relationship (14–16).

Continuous monitoring may be a tentative solution to encounter the solution. An efficient operating theater planning and scheduling provide efficient health care delivery system. University hospitals had significantly higher cancellation rates than did smaller hospitals, and among the services, general surgery services had the highest cancellation rate (17). Previous studies conducted in low-income and developed countries have produced a strong body of evidence suggesting that the burden of these cancellations is excessively high in developing countries (18).

1.2 Statements of the problem

Elective surgery would have an implication on patient satisfaction, staff morale and hospital-patient relationships. It is, thus, an indirect way of assessing the quality of surgical services and care (12,13). Elective surgeries have the advantage of advance knowledge, planning and preparation, with the possibility for prevention and preparation for complications, to achieve reduced morbidities and for improved outcome (11,19).

Globally, approximately 312.9 million operations are conducted every year out of which 10% up to 40% of elective surgery were cancelled however, in low-income countries, cancellation rates are as high as 48.5%. While it may not be practically possible to have a zero percent cancellation rate in health facilities, especially due to unforeseen, unavoidable circumstances, an incidence rate of less than 10 % may be permissible. In Ethiopia previous study reported from different university hospitals ranges b/n 8.9%-33%. Elective surgery cancellation causes reduction in the efficiency of operating rooms and, consequently of hospitals. Its associated with wide-ranging clinical, psychological, and economic consequences to the patients, hospitals, and health care providers, although patients are the most affected (18,20–23).

It is a well-known fact that if resources are not properly utilized, the general population suffers, this is especially true about the lower income groups, who depend more on public or government services for most of their healthcare needs. The cost of facilities and equipment that are underutilized adds to the cost of services, which is ultimately passed on to patients. Therefore, avoiding cancellation is an essential step to reducing these costs (24).

Cancellation of elective surgery may cause significant and undesirable consequences such as emotional stress to the patient and his / her family, in addition to increasing financial burden and social disturbances. These may worsen client conditions and also lead to morbidity as well as mortality. Cancellation of scheduled surgery creates an economic and psychological effect for patients and caregivers. It has long term negative emotional effects on the patient which includes anxiety and depression after hospital discharge (25).

Reasons of cancelation might be Avoidable reasons, cancellation of surgical procedure due to inadequate preoperative preparation, issues with the operating schedule, cancelling surgery due to shortage of equipment and staff. Unavoidable reasons change in the medical condition of the patient, emergency procedures which interfere with the elective operating schedule etc. Healthcare facilities have the goal of taking appropriate steps that will have an impact on the avoidable factors for cancelling elective cases in order to reduce the hospital's costs, shorten the number of hospitalization days, enhance the utilization of the operating rooms, enable better distribution of the staff and increase the patient's satisfaction level. In accordance with the Hospital's organization, internal work evaluation is conducted in order to improve efficiency, safety and quality of healthcare services. The rate of elective case cancellation on the day of surgery is an important health care quality indicators (8,26).

Increasing patient satisfaction through efficient practice is an appropriate objective of a healthcare system. A high cancellation rate for elective surgical procedures makes it difficult to accomplish this. Cancellation reduces operating room efficiency and increases treatment costs. Cancellation of operations in hospitals is a significant problem with far reaching consequences Cancellation of an elective surgery increases the patient's stay in the hospital and associated inconvenience (11,27,28).

In order to provide a solution for the patient problem as well as the hospital efficiency the stakeholders should have identifies the preventable causes of cancellation and focus on the solution This study was to assess current problems or factors which aggravate the elective case cancellation of public teaching hospital of Addis Ababa town.

1.3. Significance of the study

The aim of this study will be reduced elective surgery cancellation and to identify the reasons for the cancellations and make suitable changes in the organization. Enhance patient satisfaction by provision service upon the schedule and special efforts would be made to inform patients with cancelled surgery adequately and arrange a new operation date as soon as possible, and reduce workload for staff, increase operation room efficiency by detecting incomplete preoperative and psychosocial problems promptly, may be of great value.

In Ethiopia the health care Resources are limited and healthcare demand is high to reduce the rates of cancelation and improve the operating theater efficiency, in this paper reasons or causes of cancellation would be recognize, analyze and appropriate measures were recommended. Every hospital is unique in terms of its service, staff pattern, demographics of the region and also the work-ethics and culture, hence its causes and the process improvements required to avert them, are unique to the local environment. The aim of this study is to determine the rate and identify the reasons for elective case cancellation. Study on this topic is important and relevant because researches and reviews are inadequate.

Identification of reasons for elective surgical case cancellation were enable the management body to make appropriate strategies and thus, make better use of its operation theatre facility as well as theater staffs. So, this research may add to the few available materials and increase the awareness and the sensitivity of the problem to health professionals, hospital managements, stakeholders and ministry of health for better management of the problem at any level. In addition to this, the result of the study was motivated and simulate for more detailed research.

2. LITERATURE REVIEW

In a hospital, the operating theatre (OT) is considered to be the heart of the technical platform that provides basis for an effective healthcare framework. It requires considerable human power and finance in order to deliver the best results in an efficient manner. Though, all major hospitals make substantial investment in ensuring the on-time availability of surgeons and theatre staff a major problem that remain prevalent in all hospitals is the cancellation of operation at last minute. The situation leads to the underutilization and inconvenience of the operation theatres. In addition to it, cancellation of planned operations also establishes the inefficiency of management. Wastage of resources and inefficient use of operation theatres is highly attributed to the late cancellation of scheduled operations. Last minute cancellation provides consequences not only for hospitals but it also affect patient interests (29).

2.1 Socio demographic characteristics

Study in china reported that 5905(52.1%) and 5426(47.9%) male and female scheduled cases respectively of which (16.7%) (18.3%) of males and female respectively were canceled cases. The average CR of females was significantly higher than that of males under the confidence level 0.95.Cancellation (30). According to general patient characteristics, 9.0% of cancelled surgeries involved male patients and 7.1% involved female patients. Regarding age groups, greater than 80-year-old group exhibited an 11.6% cancellation rate (31). The age of patients ranged between 2 to 90 years; average 43.7, there was no significant difference between males and females in the cancellation group (male to females ratio was 1:0, 85 and $p>0.05$) (32).

The distribution of the patients whose procedures were cancelled according to sex showed 137 (51.1%) males and 131(48.9%) females with a male-to-female ratio of 1.1:1. Out of a total of 648 male patients, 137 (21.1%) had cancellation of procedures compared with 131 of 676 (19.4%) females. There was no statistically significant difference in the rate of procedure cancellation between the sexes ($p = 0.728$) (33). Cancelation rate by age category The age between 61 and 70 was the highest cancelation age group 13 (36%) with the list under 10 years old and 11- 20 years both had 1 (2.5%) cancelation (34).

study in Jimma indicated that Of 678 (47.14%) male and 760 (52.86%) female patients scheduled for the operation, about 45.6% male and 54.4 % female ware not operated on the intended day of schedule respectively (35). A total 462 elective surgical cases were scheduled for operation during the study period. The mean age of the participant was 26.7 ± 4.37(SD) years and a majority of the participants were in the age group 21–30 years. From the study 316(68.4%) were operated on the intended day of surgery and 146(31.6%) were cancelled. From the cancelled cases 83(56.8%) were male and 61(43.2%) were female. Male to female ratio was 1.31:1. Male have a high rate of cancellation than female (36).

2.2 Prevalence of elective surgery cancellation

Elective surgery cancelation rate varies from 4.4% to 36.9% (37,38). It is because difference in study design, hospital setup, population dynamics etc. Many prospective previous studies (33,36,37,39–41) on cancellations have been yielding somewhat different results from retrospective data (30,42). Cancelation rates of recent study in USA 4.4% (37), United Kingdom (UK) 10% (41), Bahrain 7.3% (32), china 17% (30), India 27.3% (43), Korea 8% (31), in Africa Nigeria 20.2% (33), Ghana 25.78% (40), Uganda 28.2% (39) and in Ethiopia, Assela teaching center 32.2% (34), Jimma university hospital 23% of cancellation (35) and Hawassa teaching hospital 31.6% (36) A systematic review and Meta-analysis on elective Surgical Case Cancellation and Reasons in Ethiopia was conducted in Gondar university the result shows the prevalence of cancellation ranges from 8.9% to 33.9% (44).

2.3 Reason of cancellation

Cancellation of elective scheduled operations on the day of surgery leads to an inefficient use of operating room (OR) time and a waste of resources. It also causes inconvenience for patients and families (45) Many literature usually reported that the reason of cancellation were administrative or facility related, patient related, medical workup related and staff related reasons others agree with avoidable reason and non-avoidable reasons and few literature would mention the reason without category.

2.3.1 Administrative or facility related

A study conducted in American University of Beirut reported that cancelation due to Resource/Facility were (52 or 19.9 %)which includes OR behind schedule (23) Equipment broken or not available (6),Implant(s) not available (1)Emergency/lifesaving case prioritized (3),scheduling error (5),staff miscommunication(13),Pre-operative instruction not communicated properly to patient (1) (37).

In UK shows that a total of 296 cancellations were due to hospital related issues (17.5%). Amongst these reasons for cancellations, the most commonly occurring were medical/nursing staffing issues (11.8%) and unavailability of or failure of medical equipment (13.5%). A smaller proportion of patients were cancelled due to over-running lists or disruptions to the list due to unforeseen emergencies (11.8%) and Booking and administration error was responsible for 10.8% of cancellations (46).

A study conducted in 245 NHS hospital England indicates 10.1% of patient was cancelled by insufficient bed capacity and 56.7% of cause of cancellation were non specified(41) in, Bahrain, cancellation due to facility related were 53% of which the main reason includes long list and cardiology consultation (47). Most common reason for cancelling elective cases was "lack of time to perform surgery", 33.51% out of the total number of cancelled cases. Lack of time to perform surgery was a statistically more prevalent avoidable reason in male patients ($P<0.05$) (26).

In china, reported that coordination and support system contributes 16.8 % of cancellation(30) in India the study reported that list over run 73% contributes for surgery cancelation (43). in Korea Considering that surgeries cancelled by the hospital are preventable and that 329 out of 60,330 cases were cancelled by the hospital, there is scope to prevent approximately 33 surgery cancellations annually (31). in Jordan facility related causes of cancellations were due to lack of time (overbooked list) or lack of necessary equipment and devices (32).

A study in Saudi a total of 16211 scheduled surgery cases in 15 different surgical specialties and 1238 (7.6%) cases were cancelled, the second reason was facility related which accounts 20.03%,among the reason are blood was not arranged 5.57% for improper scheduling 4.84%, lack of equipment 4.20% and others (42).

In Africa reported that Facility-based factors contributed 27.6% and 30.7% in Nigeria and Ghana respectively of cancellation rate. This wide based factors included equipment malfunction or breakdown, non-availability of operating room spaces (particularly when emergency cases encroach), power outages, Oxygen not available, Blood not available, Sterile drapes not available, faulty anaesthetic machine, unavailability of the surgical implant and air condition malfunctioning among others (33,40).

In Burkina Faso Cancellations were related to equipment (47.4%), and long preceding procedure 2.8% was parts of facility related factors (38). Facility-related factors in Uganda were responsible for more than two-thirds of the cancellations at Mulago which accounts 67.83% common reasons were Insufficient time in the theatre to complete the procedure by the required time44cases out of 80(55%) in this category and Emergency case prioritized 9(11.5%) (39).

In Ethiopia, Assela, from 17 canceled case due to administrative related causes were 7 (41.2) the most common reason was due to Overload schedule and next to it due to no sterile cloth or autoclave was not done 6 (23.5%) was canceled. From surgical related cause only 1 (0.9%) case was canceled secondary to change in treatment plan (34).

Hospital administration related factors in Jimma accounted in 21.87% of cases of patient cancellation. Of these non-availability of operating room due to emergency operation (13.21%), shortage of operating time (5.32%) and Non availability of technician or other supportive staff (3.34%) (35). administration related reason accounts for 21.2% for cancellation, the commonest were failed to prepare cross-matched blood 12(8%) followed by OR material shortage and bed unavailability 8(5.5%) and oxygen (36).

2.3.2 Patient related reasons

In American university of Beirut Patient related causes were (n=46 or 17.6 %) Patient did not show up for surgery 29, Patient changed mind about surgery 7, Patient had a panic attack 1, Patient refused surgery 4, Patient's family refused surgery 2, Patient left against medical advice 1, Patient Postponed 2 (37). Patient related reason in Bahrain were 7% (47) in china Tsinghua university hospital shows that 13% of cancellation was contributed by patient related issue (30) In Korea Of 4834 cancelled surgeries 4505 (93.2%) were cancelled by the patients, out of which the main reasons for cancellation was 1566 (32.4%) because of patient refused surgery; and 950 (19.7%) because of delay due to personal reasons (31)

In Jordan the most common causes for cancellations were patient-related, around 68% of the cancellations were due to patients' absence and their medical fitness for surgery at the day of planned operation (32). in Saudi study shows patients related, 42.81% includes failure of the patients to attend 20.76% and on patients request 4.77% of cancelled cases (42). in Nigeria reported that Patient-related factors were the leading causes of cancellation of scheduled surgeries (35.1%), these problems range from patients' failure to show up for surgery, financial constraints, sudden withdraw of consent for surgery to sudden death before the scheduled day (33).Study reported that patient related reason were 50.4%. The most common patient-related reason for the cancellation was patient non-attendance which accounted for 40.7% of all cancellations and 80.8% within the category (40). In Burkina Faso patients related cancellation were (31.6%) (38) Patient-related reasons 7.82% in Uganda (39) patient related factor (13.0%) (35).

2.3.3 Medical workup related reason

In America the most common category for DOS cancellation was work-up/medical condition which accounted for 85 cancelled cases (or 32.6 % of all elective surgical cancellations) Workup/Medical condition (85 or 32.6 %) Change in medical status, Incomplete Surgical-work up 4, Incomplete Medical evaluation 34, Abnormal test 5,Change in treatment plan 6 Difficult unobtainable IV access 1, Pre-operative instructions not followed properly 4 (37).

In this study the second largest cause of reasons for same-day cancellations were medical reasons, accounting for 565 cancellations. Within this group, over 2/3 of cancellations were due to the patient being medically unfit for either the type of anaesthetic or surgery they were listed for (n=388/565, 68.7%) followed by an operation being deemed unnecessary (n=97/565, 17.2%) or the patient requiring additional investigations prior to undergoing surgery (n=64/565, 11.3%) the patient was acutely unwell and was either hospitalized with the illness or was deemed on the day not to be well enough to undergo general anesthesia owing to an infection of the respiratory/ urinary tract or skin (n=114/831, 13.7%). A smaller proportion of patients did not follow the pre-operative advice they were given (such as smoking cessation, weight loss, dietary advice, wearing of certain medical devices) and were therefore deemed not suitable to undergo the planned surgery on that particular day (46).

In UK study 27.6% of cancellation were related to clinical reason (41) in Bahrain the most medical reason was hypertension it covers 9.2%,Chest infection 5%,upper respiratory infection 4.5%, high gluose3.5% (47) The second most common reason for cancelling a case was "surgery cancelled due to medical/anesthetic reasons 31.38% out of the total number of cancelled cases. Unforeseen anesthetic or surgical problems may delay the planned list (26).

In china one study show medical workup was the major reason and accounts 25.8% of cancellation it includes per operative diagnostic issue and sudden change of patient conditions (30) In Korea in terms of inpatients (≥2 days admission), 8.2% had cancelled surgeries and the cancellation rate was 10.2% in patients with both hypertension and diabetes (31). improper work-up 9.45% (42).

Pre-operative evaluation problems (30.6%) were also high on the list of the causes of cancellation of procedures. Some of the specific reasons included uncontrolled comorbidities such as hypertension and diabetes, recent onset of respiratory tract infections, and acute onset of cardiovascular disorders. This was also the second leading cause for cancellation of 9 elective surgeries (33).

Medical-related, 15.5%, includes Unavailability of blood was the most common medical/work up related reasons for total cancellations 4.8% and accounted for 30.95% in this category (40) medical problems were the second common with 9 (25%) inadequate preparation of patient 16.6% and nine patients were canceled by medical illness (8%) from total 112 cases which hypertension was the highest according to the study (34).

Patient-related reasons, (30%) The highest frequent patient-related reasons for elective case cancellation were patients who have acute and chronic medical illness (11.6%) and the leading reason is patient on medication for the treatment of this illness. Hypertension (35.3%), diabetes mellitus (23.5%), Ischemic heart diseases (17.6%), urinary tract infections and other illnesses each account, (11.8%) were the commonest illness (36).

2.3.4. Staff Related Reason

Surgeon related factor (7 or 2.7 %), Surgeon not available, Surgeon sick, Surgeon was operating in another hospital and Surgeon was travelling (37). cases cancelled by anesthesia were 35% the second reasons next to facility (47). The third most common reason for elective case can

cancellation on the day of surgery was "surgery cancelled by the surgeon" (11.97%) (26). in china Tsinghua university doctor related factors account 8.5% (30).in Korea cancellation due to surgeon not available(65, 1.3%)(31) related with surgeons 7.19% and with anesthesia 1.45%(42)

In Uganda Health professional-related reasons were 24.35% out of this Anesthetist not available 21(61.76%) Theatre nurse not available 6(17.6%) Surgeon changed patient's management plan 3(8%) Surgeon with required expertise not available 2(5.8%) Surgeon changed patient's diagnosis 2(5.8) (39).

The most frequent causes for elective case cancellation were surgeon-related factors, which accounts for 51 cases (35.8%) these are scheduling an emergency procedure (11.6%) followed by over scheduling of elective cases (10.9%) and unavailability of the surgeon (10.3%) and Anesthesia related. patient unfit for anesthesia 10(6.8%) Abnormal lab results 5(3.4%) and Difficult intubation 4(2.7%) (36).

2.3.5 Avoidable and non- avoidable

One hundred eighty-seven DOS cancellations (71.6 %) were judged as potentially avoidable while 74 cases (28.4 %) were judged as unavoidable. Of the medical-related cancellations (85), incomplete surgical-work up (4) and incomplete medical evaluation (34) were judged as potentially avoidable. Of the patient-related cancellations (46), patient did not show up for surgery (29) was judged as potentially avoidable. As for the cancellations under resource/facility (52), the following reasons were judged as avoidable: equipment broken or not available (n=6), implant not available (1), scheduling error (5), staff miscommunication (13), and pre-operative instruction not communicated properly to patient (1). All other cancellations under "bed", "admission" and "surgeon" category respectively, were judged as potentially avoidable. Unavoidable reasons change in treatment plan (6) Emergency/life-saving case that occupied the OR (3),Surgeon not available (4), Surgeon was operating in another hospital (1), Surgeon was travelling (1), Surgeon sick (1) (37).

medical/anesthetic reasons", 31.38% out of the total number of cancelled cases unforeseen anesthetic or surgical problems may delay the planned list. This reason falls under the unavoidable causes given that the condition of the surgical patient acutely worsened prior to the surgical procedure, an increase in blood pressure right before surgery, cardiac arrhythmia and

upper respiratory infection were the most common etiologies. A surgeon can cancel a surgical procedure for various reasons. Some of the reasons may be an inadequate indication for the surgical procedure most commonly set by junior surgeons or the start of the menstrual cycle in female patients on the day of surgery.

Lack of time due to emergency procedures is other unavoidable causes of cancellation involving patients delayed because the surgical team was needed elsewhere and represented 6.12% of the total number of canceled operations. Our hospital does not have a dedicated operating room and/or surgical team that would only be used for patients requiring emergency surgery(26) The reasons for the cancellation of the procedures were regarded as avoidable (preoperative preparation related, facility related, and personnel related problems) among 174 (64.9%) cases. On the other hand, non-avoidable reasons (such as patient related factors) were recorded among 94 (35.1%) cases (33)

2.3.6 Specialty of surgery

Analysis across the different specialties revealed that Orthopaedic Surgery had the highest same-day cancellation rate (32.1%), followed by Ophthalmology (26.4%) and then General Surgery (14.9%, Gynaecology 8.8% and urology 3.3% of elective day surgery were cancelled (32) in another study conducted in UK it shows that orthopeadics surgery 26.5%,general surgery 15.5%,neurosurgery 21, and obstetrics 10.4% of cancelled case (46).

The number of cancelled cases in each specialty was as follows:(25.9%) general surgery, (4.5%) thoracic and vascular, (17.8%) urology, (9.7%) orthopedic, (9.3%) gynecology, (4.8%) pediatric surgery,(1.2%) Gastrology, (7.1%)ENT, (2.4%) maxillofacial, (8.1%) ophthalmology, (3.5%) neurosurgery (47). study in India General surgery also had the highest percentage share of total cancellations at 54.8%, followed by obstetrics gynecology 16.2%, orthopedics 13.1%, ENT 9.1%, urology 3.5%, pediatric surgery 2%, CTVS and neurosurgery (0.5% each(43) study in Saudi , Out of total cancelled cases, Orthopedics' cases were 33.9%, general surgery 27.5%, chest 10.7%, obstetrics 7.7%, urology 5.6%, ENT 5.2%, pediatrics 5.2%,and ophthalmology (4.8%) (42).

The total contribution of cancelled surgical cases by each specialty were (28.1%) trauma/orthopaedics (25.2%) general surgery,(11.2%) urology, (10.8%) Paediatric surgery, (11.2%) Gynaecology, (5.5%) plastic, (4.7%) neurosurgery and (3.0%) cardio thoracic as indicated (40). Abdominal wall 22.3% Gynaecology 11.7 % Urology 4.9 % Bone 3.9 % (38) in Uganda cancelation with in a specialty were 41% orthopedics, 15.5% Neurosurgery,9.5% pedeatrics, 9% Urology, 6.5% ENT 6%GS and Cardiothoracic 5.8% cancelled cases (39) Orthopedics 29%,Genral surgery 17.% Gynaecology 15.1% Urology 10.3%, Pediatrics 8.6% (36)

2.3.7 Only listed Reasons

A study in India shows the most common reason stated for case cancellation was list over run (73%), followed by patient being unfit for surgery (14.2%), strikes (4.5%) and equipment /Consumable Problem 2%, other reasons contributed to a very small share (43). Lack of linen/ surgical drapes, Lack of theatre space, no bed, Over booked list, Staff not available and Others (n=51, 18.9%) Biomedical Scientist on strike, Blood bank not functioning, Family issues inconvenient appointment date, medical school examination, Patient inadequately prepared and some investigations need to be done (40) .

In Bahrain the most common causes for cancellation were 110 (26.1%) long list, 39 (9.2%) high blood pressure,38 (9%) cardiology consultation, 21 (5%) chest infection, 19 (4.5%) upper respiratory tract infection and 15 (3.5%) high glucose levels. Three hundred eighty (90.3%) cases were canceled before reaching the theatre, forty-one (9.7%) cases were canceled in the Operation In the OT, 18 (4.3%) high blood pressure was the main reason; other seasons were as follows: 4 (0.9%) surgery was not indicated, 3 (0.7%) non-palpable lesion, 2 (0.5%) allergic reaction, 2 (0.5%) delay by anesthesia, 2 (0.5%) cardiology consultation (only 31 out of 41) (47) Common reasons for elective surgical patient cancelation is in- appropriate scheduling (33.5%) followed by lack of sterile drape (23.5%) and in appropriate patient preparation (11.8%) (35).

2.3.8 Covid 19 related cancellation

Patients with planned elective surgery should be required to isolate for 2 weeks and wherever possible, test negative for COVID- 19 within 72 hours of admission. Procedures would be postponed until full recovery in those with active infection. Every member of the operative team including anaesthetists, surgeon and nurses should be either COVID- 19 negative or have immunity assessed based on antibody tests (48)

A prospective cohort study was conducted in Europe, Patients underwent surgery in 78 hospitals from 16 countries, out of 122 patients with a previous positive SARS-CoV-2 swab, 22·1% (n = 27) were operated within 2-weeks of diagnosis, 49·2% (n = 60) between 2 and 4 weeks, and 28·7% (n = 35) after 4 weeks. The number of infected patients increased during each month of the study period. When split by time from swab to surgery, both pulmonary complications and mortality were lowest at least 4 weeks after notification of a positive swab test.(49)

A study in United States a total of 535 vascular surgeons responded to the survey from 45 states. Most of the respondents were male (73.1%), white (70.7%), practiced in urban settings (81.7%), and in teaching hospitals (66.8%). There was no variation among hospitals. The overwhelming majority of respondents (91.7%) noted elective surgery cancellation, procedures on patients with Covid-19, which was either identified at the time of the surgery or later in the hospital course (82.7%) (50)

A retrospective cohort study including 34 covid positive operative patients who underwent elective surgery between January and February 2020 in three Chinese hospitals found all patients developed pneumonia shortly after surgery and 15 (44.1%) patients needed ICU care, and the mortality rate was 20.5%.(51).

An international multicentre cohort study, aimed to determine whether COVID-19–free surgical pathway for elective cancer surgery was associated with lower postoperative pulmonary complication. Mortality was higher in patients with SARS-CoV-2 infection (OR, 29.34; 95% CI). It was lower in patients operated on in COVID-19–free surgical pathways (OR, 0.45; 95% CI). Of the 30-day deaths, 44.0% (59 of 134) were associated with SARS-CoV-2 infection. Mortality was higher after pulmonary complications in patients with SARS-CoV-2 (30.8%; 40 of 130) than in patients without infection with pulmonary complications (10.7%; 26 of 244).(52)

A survey conducted in children surgery in low- and middle-income countries, and a total of 132 responses from 120 unique institution across 30 low middle-income countries that operation performed in a child positive for COVID 19 at facility were indicated only 26 patient underwent surgery, low income 1(3.8%) low middle income 5(19%) upper middle income 20(76%) (53)

2.4 Summary of conceptual framework

There are many reasons of cancellation of elective surgical cases; and they differ from hospital to hospital. Attributes of these cancellations can be avoidable and non-avoidable and avoidable cancellations were the commonest (26,37,46). Some of studies group reasons for cancellations into relatively broad categories, while others simply list causes without grouping them. In most literature reasons of cancelation were divided in to administrative, medical work up, patient related and medical reasons. Administrative (facility related) reason which accounts 4%-47% the listed problem were coordination problem, failure of hospital equipment, un available of implants lack of sterile drape, power breakage, lack of ICU beds, blood not prepared lack of oxygen , and inappropriate scheduling (31,33,37,40–42).

Cancelation due to preoperative evaluation accounts 15-33% and listed reasons were operation not necessary, surgery postponed in clinical ground ,require additional investigation, treatment plan were changed, patient not follow preoperative instruction and necessary equipment not ready (32,39,42). Another reason was patient related reason which accounts 13-50% it includes patient refusal, patient delayed due to personal reason, pregnancy, sudden medical condition change and financial reasons (35–37,39,42,54). Medical reason was account 10-25% the commonest problem were hypertension, DM, respiratory infection ischemic heart disease acute febrile illness (28,31–33,42,47,54).

Surgeon related reasons are emergency procedure, over list and not available and it accounts 2.7-35% (30,32,36,37,39,41,54). Anesthesia related are not available difficult intubation and machine problem(36,38) Others divide cancellation reason in avoidable non avoidable causes , avoidable reason accounts 50-70% and non-avoidable reason occurs 28-35% and some literature only listed the reasons of cancellation like lack of theater time, admission, lack of documentation etc. (31,32,54).

2.5 Conceptual frame work

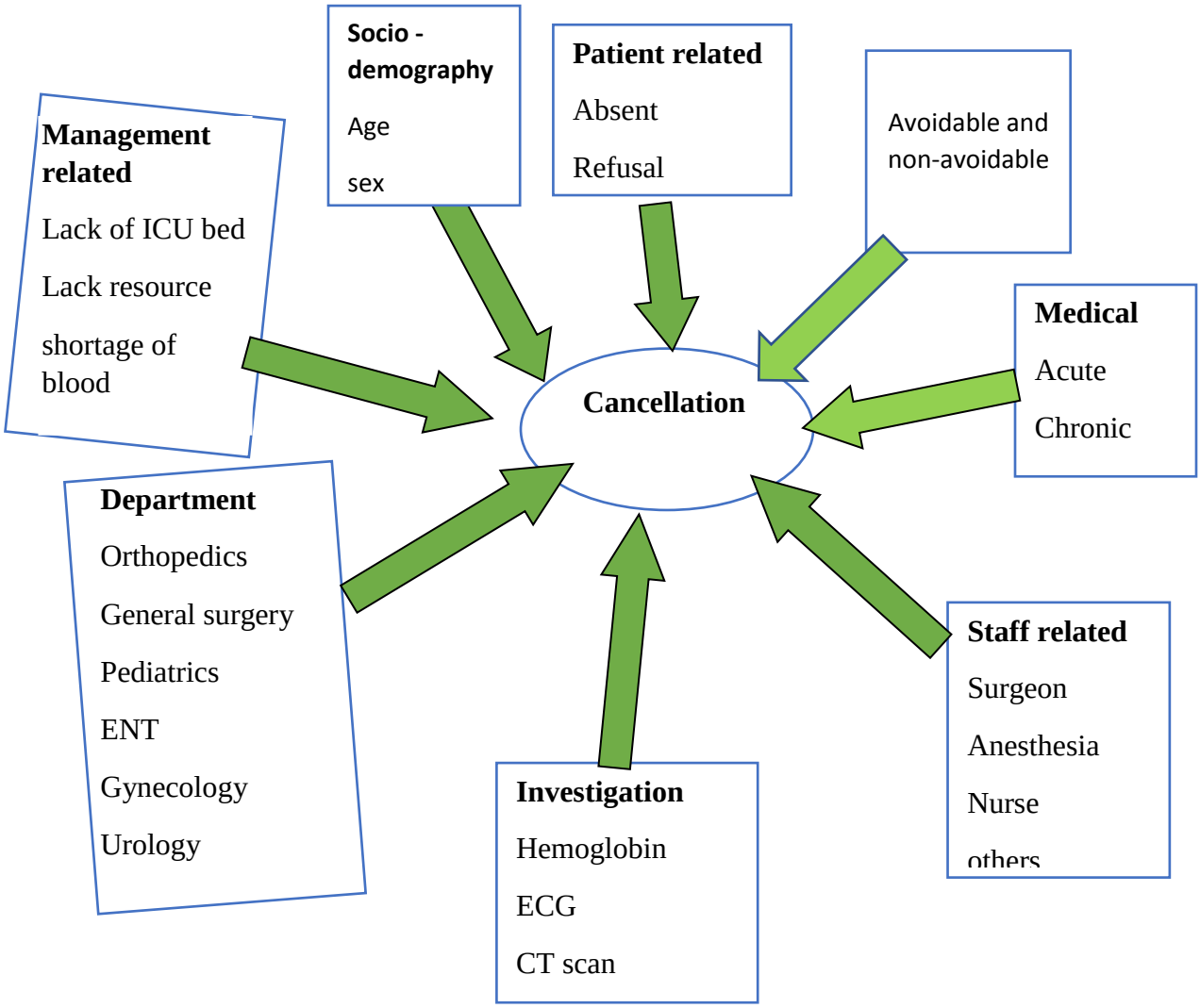

Diagram 1 Conceptual framework for examining cancellation of elective surgery and its associated factors in government teaching hospitals of Addis Ababa, Ethiopia, 2021. and adopted from Shiferaw A.(28).

3. OBJECTIVES

3.1. General objectives:

To assess cancelation of elective surgery and its associated factors among public teaching hospitals of Addis Ababa, Ethiopia, 2021

3.2. Specific objectives:

- To determine the magnitude of cancelation of elective surgery among public teaching hospital of Addis Ababa, Ethiopia, 2021.
- To identify factors associated with cancellation of elective surgery among public teaching hospital of Addis Ababa, Ethiopia, 2021.

4. METHOD

4.1 Study setting and period

This study was conducted in Addis Ababa, the capital city of Ethiopia. The city has a subtropical highland climate. Addis Ababa city currently has a population of 4.8 million people in the urban area and 2.7 million people in its city area and all ethnic groups of the country are represented in this capital with the biggest groups being the Amhara, Oromo, Gurage, Tigray and Gamo. Languages spoken include; Amharic, Oromiffa, Gurage, Gamo, Tigrinya and Silt'e. The religion with the most devotees in the city is Orthodox followed by Muslims, protestant and catholic (55)

In this city, there are 14 public hospitals, 34 private hospitals, 86 health centers and various NGOs and health institutions. Out of 14 public hospitals three of them are public teaching hospitals these are Tikur Anbesa Specialized Hospital, St. Paul's Hospital Millennium Medical college, and Yekatit 12 medical college. From these three public teaching hospitals we selected the two hospitals by using simple random sampling technique. These hospitals are relatively equipped and serve as almost the whole population of the city as well as receive patients from other regions for a sub specialty area.

These hospitals are tertiary referral hospitals which perform activities in a sub specialist level TASH have 850 beds and 9 OR and Yekatite 12 hospital medical college have 5 OR suite. They are also a teaching hospital for the Medical College and it gives service to the patients under different clinical disciplines which include orthopedics, general surgery, obstetrics, gynecology, pediatrics, cardiothoracic, urology, neurosurgery and ENT surgery and also internal medicine. The data obtain from these two hospitals until the required number of patients fulfill in all selected specialty, to assess the cancellation rate and factors of cancellation among elective scheduled surgery in 2021.

4.2. Study design

A Hospital based cross-sectional study were conducted in all major operation rooms in all surgical specialty among elective surgery scheduled patients from Feb 1 to March 30/2021 GC.

4.3 Source Population

4.3.1 Study population

The source of population were all surgical patients those who are admitted in hospital and waiting for surgery according to the schedule at Tikur Anbesa specialized hospital and Yekatite 12 medical college during the study period.

4.3.2 Study subjects

The study subjects include all patients, of all ages, both genders, who were scheduled for elective surgical operations from all surgical specialties at TASH and Yekatit hospitals all major OR table during the study period.

4.4 Eligibility criteria

4.4.1 Inclusion criteria

All electives surgical schedule patients during the time of study period.

4.4.2 Exclusion criteria

Listed for elective surgery but done before the day of schedule as Emergency, Minor ambulatory surgery outside major OR theater and or referred to other hospital.

4.5 Sample size

4.5.1 Sample size determinations. The Sample size were calculated by manually taking the p value of 21.41% from a systematic review and Meta-analysis study done at Gander university, Ethiopia (21). having more or less represented the general population of this study. The sample size was calculated by using the following formula.

$n=z^2 * p (1-p)/d^2$, where;

n = required sample size

p = incidence of day of surgery cancelation

d = margin of error …0.05

z=95% Confidence interval: Z1- α/2 =1.96

n=1.96*1.96*0.2141(1-0.2141)/0.05*0.05 =259

From the above initial population calculated sample size, N or population number is < 10,000 population that needs adjustment using final correction formula.

nf = n / (1+ (n/N))

where ni =calculated sample size

N = Total target population of the study area

nf =final sample size

nf=259/ (1+(259/950))=204

n=204, considering 10% non-responders sample size were = **225**

Distribution of study subject for each hospital was black lion hospital (136)

and Yekatite (89).

4.5.2 Sampling procedure

We were used the Random sampling techniques and includes two public teaching hospitals of Addis Ababa these are black lion specialized hospital and Yekatit 12 medical college, All patients scheduled for elective surgical procedures during the study period were included in the study, and those listed for elective surgery but done before the day of schedule as an emergency, patients scheduled in a minor operating room for minor surgery, which does not have preoperative assessment sheet were excluded.

Before conducting the interview, we were obtained the consent from all study participants and by using non probability, purposive sampling technique interview the participant until the required sample size. Data collectors was recruited based on reviewing their experience on data collection and OR training was a selection criterion, the recruitment was done by the OR directorate collaborate with the principal investigation.

4.6 Study variables

4.6.1 Independent variables:

- ✓ Age
- ✓ Sex
- ✓ Department(specialty)

Reasons for cancellation

1. Patients related

2. Medical related

3. Management or facility related

4. Surgeon related

5. Anesthesia related

6. Shortage of resources

4.6.2 Dependent variables

Case cancellation

4.7. Operational Definitions

Operating theater: is a facility within a hospital where surgical operations are carried out in an aseptic environment

Surgery: is medical treatment in which a doctor cuts into someone's body in order to repair or remove damaged or diseased parts.

Elective surgery: - is a non-emergency surgery which is medically necessary, but which can be delayed for at least 24 hours.

Cancelation: - postponing or ignoring to do surgical procedure after planned and posted to do it

4.8. Data collection procedure and tools

The data was collected by reviewing the posted daily schedule lists for every elective surgery at the major OR using a pre-test structured questionnaire adopted English version from Addis Shiferaw with little modification (28) and we prepared the Amharic version of the questionnaire.

A pretest was conduct before actual data collection at Zewuditu Memorial Hospital which is similar setup to our study hospitals. A pre-test questionnaire containing basic socio-demographic variables and presumed reasons/risk factors for cancellation were included. Reasons for cancellation were determined by interviewing the operation theatre staffs (surgeons, anesthetists, or nurses...) or patients themselves when necessary and were immediately record on the pre-tested questionnaire by the data collectors.

The data was collected by six BSC nurses, a minimum of four years' work experience, data collection background and OR training and one MSC nursing supervisor were provide one day training on how to collect the data and purpose of the study by using lecture and demonstration about data collection procedure and information to be collected and collect the information in collaboration with the principal investigator. The collected data were checked every day by supervisor and principal investigators.

4.9. Data entry and analysis

Data were checked for consistency of information, code and cleanness and manually edited and entered into the computer using Epi Info version 3.5.4 for further editing. Edited data was exported to the SPSS version 24 statistical software for analysis. Descriptive and basic analytical

statistics were used to summarize the data and present in the form of proportion frequency, table, bar graph, pie chart, mean, standard deviation and bivariate.

4.10. Data quality assurance

To assure quality of the data the following measures were undertaken; during the actual data collection process, supervisor was cross checks the data collection process frequently for completeness and well filled. The data was cleaned for inconsistencies and missing values and amendment were considered as needed before data analysis.

4.11. Ethical consideration

Proposal approval from the department of nursing and midwifery, and Addis Ababa public Health Research and emergency management directorate institutional review board, ethical clearance were obtained from the corresponding institution, to conduct the research.

And also, permission was requested from TASH, and Yekatit 12 hospitals medical directors and OR directorates to collect data and get the necessary cooperation of the Hospital. For all activities carried out in the OR, Verbal consent was taken after explaining about the study and its significance. The information received was confidential and there is no need of writing the patient's names; instead, medical record number was used to ensure confidentiality. The data collectors and supervisor were oriented by the principal investigator and collect the data properly.

4.12. Dissemination of findings

The findings of the study are submitted to Addis Ababa University College of health sciences, school of nursing and midwifery and Addis Ababa public Health Research and emergency management directorate and other concerned bodies as a partial fulfillment of the requirement for perioperative cardiothoracic specialty certificate. In addition, the result will be shared for each hospital and the manuscript of the research will be prepared and submitted to appropriate journals for possible publication and a copy was given to the library of Health science, and school of nursing and for each OR specialty**.**

5. RESULTS

5.1: **Socio-demographic characteristics**

A total of 924 elective surgical cases were scheduled for operation during the study period. The mean age of the participant was 35.2± 19.17(SD) years and most of the participants were in the age group of 31–40 years. From the study 699 patients were operated on the intended day of surgery and 225 patients were cancelled. Male gender comprises of 134 in number and 91 for females. Male have a high rate of cancellation than female (Table -1). Regarding the hospital CR TASH was 459 patient plan for surgery of which 136(29.63) cancelled and yekatite hospital was also 465patients plan for surgery out of which 89(19.14%) cancelled

Table 1 Sociodemographic characteristics of cancelled Scheduled surgical elective cases at TASH and Yekatit 12 hospital of Addis Ababa town from February 1 to March 30, 2021, Ethiopia.

Socio-demographic data		Total scheduled for Surgery (%)	Surgery cancelled	
			In No	In %
Age	<10	158	32	20.25
	10-20	70	20	28.57
	21-30	175	37	21.14
	31-40	186	57	30.64
	41-50	113	36	31.85
	51-60	113	20	17.7
	61-70	76	14	18.42
	Above 70	33	9	27.3
Total		924	225	
Gender	Male	492	134	27.8
	Female	432	91	20.5

General surgery and orthopedics had the highest number of cancellation (45 and 36 respectively) whereas Vascular and maxillofacial surgery had the least number of cancellations (7 and 2) respectively. Pattern of cancellations of every surgical specialty as shown in figure-1

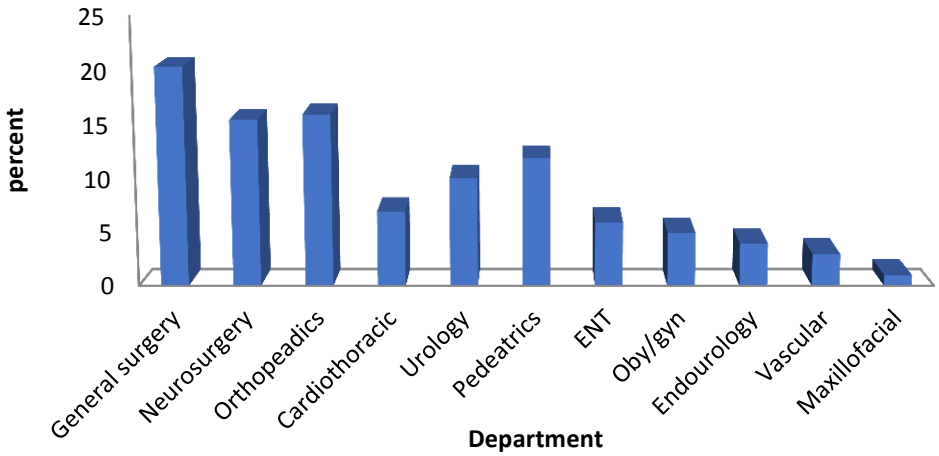

Figure 1 Distribution of cancelled scheduled elective surgical cases in each department/specialty at TASH and Yekatit 12 hospitals of Addis Ababa town from February 1 to March 30,2021, Ethiopia.

The most common causes for cancellations were time related factor (overbooked list), around 26.22% of the cancellations were due to prolonged previous case, over scheduling and late skin incision time at the day of planned operation (Table-2)

Table 2. Reason for cancelled scheduled elective surgical cases at TASH and yekatite 12 hospital of Addis Ababa town from February 1 to March 30,2021, Ethiopia

Shortage of time	Frequency	Percent
Over scheduling	21	35.6
Prolonged first case	27	45.8
Late skin incision	10	16.9
Emergency priority	1	1.7
Total	59	100

Frequency of elective surgery cancelation were 72% of the patient cancelled for first time and the rest 28% cancelled two and above times.

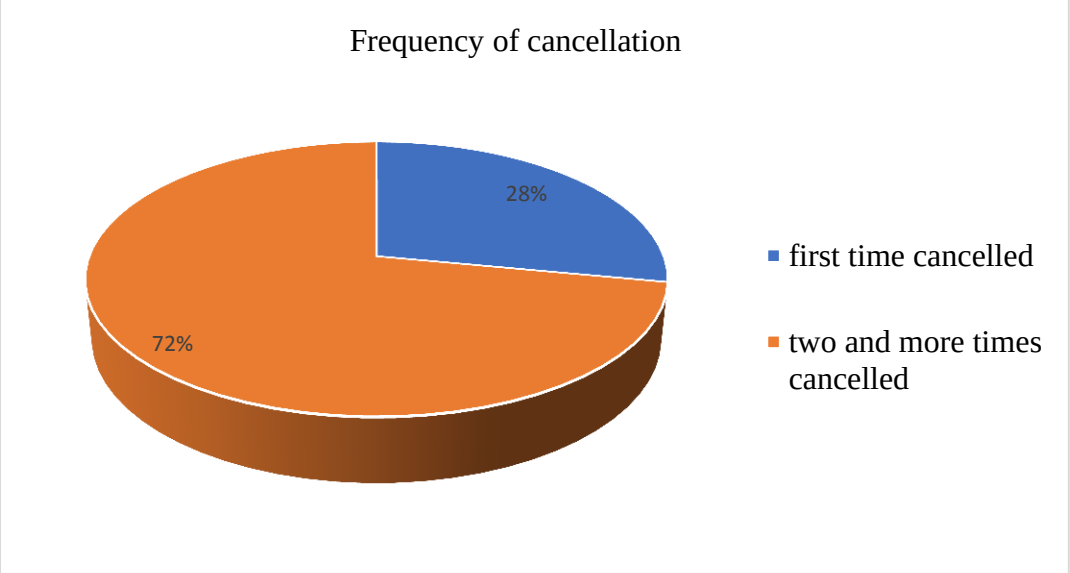

Figure 2. Shows number of cancelation experience of participant in TASH and yekatite hospitals of Addis Ababa, from February 1-March 30/2021, Ethiopia.

The second causes of cancellations were due to facility related or management related such as lack of ICU beds with mechanical ventilator, around 23.56%, in this category, lack of necessary equipment and devices it accounts 25% and lack of oxygen 19% reason of cancellation had shown in (Table-3).

Table 3. Reason for facility related scheduled elective surgery cancelation in TASH and Yekatite 12 hospitals, of Addis Ababa, from February 1-March 30/2021. Ethiopia.

Facility related reason	Frequency	Percent
Lack of equipment/materials/	13	24.5
Blood not available	7	13.2
Lack of ICU beds/ventilators /	14	26.4
Lack of oxygen	10	18.9
Autoclave malfunction	6	11.3
Power breakage	3	5.7
Total	53	100

Other causes of cancellation in our study were uncontrolled medical illness 41(18.22%) out of which the most common disease were hypertension and upper respiratory infection and the next cause of cancelation was covid 19 related reason accounts 34(15.11%) in this category common reasons are positive covid 19 result and result was not reach or not available during the time of surgery.

Patient related reasons contributed 16(7.1%) in this category patient on medication is common. Lack of important investigation 13(5.4%) lack of electrolyte and echocardiogram investigation were the most common problems. Staff related reasons 8(3.6%) only surgeon and anesthesia staff participate in cancelation of patients and unexpected emergency 1(.45%) due to difficult intubation (Table-4)

Table 4. Reasons for cancelled Elective surgical cases in Tikur Anbesa specialized hospital (TASH) and Yekatit 12 hospital of Addis Ababa, from February 1-March 30/2021, Ethiopia

Category of reasons	Reason for cancelation	Cancelled case		Total number
		In No	In %	
Medical reasons	Uncontrolled hypertension	14	34.14	41(18.22)
	Uncontrolled DM	3	7.31	
	Chronic heart disease	5	12.19	
	Uncontrolled thyroid disease	4	9.75	
	AFI (acute febrile illness)	5	12.19	
	Upper Respiratory tract infection	10	24.39	
Patient related reasons	Patient refused /request/	2	12.5	16(7.1)
	Patient financial shortage	2	12.5	
	Patient not fasting	3	18.75	
	Patient on medication	4	25	
	Absence from the OR	3	18.75	
	others	2	12.5	
Staff related	Surgeon related	6	75	8(3.6)
	Anesthesia related	2	25	
Lack of important investigation	Hematocrit (hemoglobin)	2	15.38	13(5.7)
	Electrolyte	4	30.76	
	Liver function test (LFT)	2	15.38	
	Renal function test (RFT)	1	7.69	
	Electrocardiogram (ECG)	3	23.07	
	CT scan/X-RAY/	1	7.69	
Covid related	COVID 19 positive	17	50	34(15.11)
	COVID 19 result pending no result	14	41.17	
	Old COVID 19 result	3	8.8	
unexpected emergency	Failed to intubation /spinal/	1	100	1(.45)
Avoidable reasons		149	66.3	
Unavoidable reasons		76	33.7	

Association of cancelled scheduled surgical elective cases

We perform bivariate analysis of gender, department and age group of which male patient OR (odds ratio) 1.403 CI (1.034-1.904), p (0.03). Department of ENT surgery with the OR 0.356 CI (.181-.697), p (.003) and Endourology surgery were OR 0.297 CI (.138-.642), p (.002). From the age group 31-40 years OR 1.740 CI (1.058-2.862), p (0.029) and 41-50 years OR 1.841CI (1.058-3.204) p (.031) were significant but in multivariate analysis only male patient OR 0.623(.441-.879) p (0.03) were significant (Table-5)

Table 5. Bivariate and multivariate analysis of gender, department and Age at TASH and yekatite 12 hospital of Addis Ababa from February 1-March 30/2021, Ethiopia

Variable		Case cancelation		COR 95%CI	P value	AOR 95%CI	P value
		yes	no				
Gender	Male	134(27.2%)	358(72%)	1.403(1.034-1.904)	0.03*	.623(.441-.879)	.007**
	Female	91(21%)	341(78.9%)	1			
Department	General surg.	45(27.8%)	117(72.2%)	1			
	Orthopedics	36(23.5%)	117(76.5%)	.783(.472-1.298)	.342	.611(.121-3.080)	.551
	Neurosurgery	35(38.8%)	55(61.2%)	1.619(.939-2.789)	.083	.870(.172-4.398)	.866
	Urology	23(33.8%)	45(66.2%)	1.300(.708-2386)	.391	.419(.081-2.160)	.299
	ENT	13(12.3%)	93(87.7%)	.356(.181-.697)	.003*	.498(.095-2.621)	.411
	Cardiothoracic	16(34.8 %)	30(65.2%)	1.357(.676-2.721)	.391	1.854(.345-9.968)	.472
	Pediatric	28(21.9%)	100(78.1%)	.687(.398-1.184)	.177	.432(0.79-2.352)	.332
	Oby/Gyn	11(20%)	44(80%)	.636(.302-1.337)	.233	1.010(.177-5.762)	.991
	Endourology	9(10.5%)	77(89.5%)	.297(.138-.642)	.002*	.791(.140-4.460)	.790
	Vascular	7(35%0	13(65%)	1.370(.514-3.650)	.529	1.975(.350-11.136)	.441
	maxillofacial	2(20%0	8(80%)	.636(.130-3.108)	.576	.453(.073-2.829)	.397
Age category	Less than 10	33(20.8%)	126(79.2%)	1			
	10-20	21(29.6%)	50(70.4%)	1.575(.824-3.010)	.169	1.198(.398-3.604)	.747
	21-30	37(21.1%)	138(78.9%)	1.056(.621-1.796)	.841	.836(.307-2.278)	.726
	31-40	56(30.3%)	129(69.7%)	1.740(1.058-2.862)	.029*	1.335(.542-3.289)	.531
	41-50	35(31.3%)	77(68.7%)	1.841(1.058-3.204)	.031*	.983(.404-2.394)	.971
	51-60	20(17.7%)	93(82.3%)	.847(.456-1.573)	.599	.875(.347-2.209)	.777
	61-70	14(18.4%)	62(81.6%)	.889(.443-1.786)	.741	1.858(.717-4.816)	.202
	Above 70	9(27.3%)	24(72.7%)	1.477(.626-3.3485)	.374	1.742(.639-4.750)	.278

**Statistically significant

In bivariate analysis for the reason of cancelation on facility related the OR shows 2.101 CI (.908-4.862) p (0.02), shortage of time OR 3.262 CI (1.661-6.560) and p (0.03) and medical reason OR 2.178 CI (1.072-4.425) and p (.017) were statistically significant (Table-6).

Also, in multivariate analysis facility related reason OR 3.619 CI (1.049-.12.488), p (0.042), shortage of time OR 4.753 CI (1.885-11.983), p (0.001) and medical reason OR 2.907 CI (1.085-7.791), p (0.034) were statistically significant but staff related, Covid 19 related, investigation and unexpected emergency were not significant (Table-6).

Table 6 Bivariate and multivariate analysis of reasons of cancelled scheduled elective surgery at TASH and Yekatite 12 hospital of Addis Ababa from February 1-March 30/2021, Ethiopia

Reason of cancelation	Frequency	COR 95%CI	P value	AOR 95% CI	P value
Patient related reason	16(7.1%)	1			
Facility related	53(23.6%)	2.101(.908-4.862)	0.02*	3.619(1.049-.12.488)	0.042**
Staff related	8(3.6%)	3.262(1.-3.916)	.949	.896(.211-3.803)	.881
Shortage of time	59(26.2%)	3.262(1.661-6.560)	0.03*	4.753(1.885-11.983)	.001**
Investigation related	13(5.7%)	.637(.202-2.010)	.442	1.433(.436-4.715)	.551
Medical problem	41(18.2%)	2.178(1.072-4.425)	.017*	2.907(1.085-7.791)	.034**
Covid 19 related	34(15.1%)	1.131(.540-2.368)	.744	.594(.220-1.606)	.305
Unexpected emergency	1(0.45%)	1.046(.65-16.930)	.975	.896(.054-14.764)	.939

** statistically significant

6. DISCUSSION

Cancellation of elective surgery is a worldwide problem though booking elective surgery is considered a contract between the patient and the healthcare institution and also determines the day of service. Elective surgical operations require a multidisciplinary approach between surgical team, hospital staff and hospital administration. Case cancellations on the day of surgery lead to underuse of OT's, increases waiting period for the patients, frustration and mental stress to the patients and their families, and increases cost and wastage of hospital consumables (2,12,16,38) Therefore, any cancellation of the booking, without prior notice or arrangement from either the patient or the healthcare provider, has far-reaching implications for both(45).

There is no consensus on the maximum acceptable case cancellation rate for efficient operating theatres, but rates under 5% are generally recommended (56). Elective surgical case cancellation in developing country ranges from 10-40% (8). In our study, the rate of cancellation of elective surgical procedures was 24.35%, indicates preoperative system was inefficient which is higher than study done in USA 4.4 % (37), UK 10% (41), Bahrain 7.3% (30), Korea 8% (31) and Nigeria 20.2% (33) and similar with studies done in Ghana 25% (40) and Jimma university teaching hospital (23%) (35) and lower than study conducted in India 27.3% (43) Uganda 28% (39), Assella 32% (34) and Hawassa 31.6% (36). This discrepancy might be due to the fact that in sociodemographic characteristics, sample size, study area, methodological difference, inappropriate scheduling and poor communication among stakeholders.

From 924 scheduled cases 492 (53.24%) male and 432(46.75%) were female, of which 225 were cancelled of this male and female were 59.6% and 40.4% respectively. This result is similar with the study done in Hawassa university hospital, were (56.8%) male and (43.2%) female. In our study Male have a high rate of cancellation than female.

The mean age of the scheduled elective surgical cases was 35.2 ± 19.17(SD), with minimum value 15 days and maximum 86 years old. Between 31-40 years old age group were the highest scheduled and canceled 198(20.1%) and 56 (25.2%) respectively and 21-30 years old group were second highest 37(16.6%) canceled groups and less frequent cancellation were over the age of seventy (4%).

Most common reasons for cancellation were shortage of time and management related 59(26.22%) and 53(23.56%) respectively. Shortage of time in our study were the most common avoidable factor which are prolonged first case 45%, over /improper/ scheduling 35%, late start skin incision 16% and poor integration or communication among staffs. This result is similar to other studies done in Bahrain, the most common causes for cancellation were 110 (26.1%) long list (47), in Bosnia and Herzegovina lack of time to perform surgery were 33.51% (38) and in Jimma cancellation due to in- appropriate scheduling were (33.5%) (35) But study higher when compared to our result which is done in India cancellation due to list over run were (73%) (43).

This is due to over booked and not know exact time of the procedure, majority of the surgery starts after 2:30 am and extended time of break between surgeries. In addition, in proper anesthesia setup and unavailability of experienced surgeons on time. Patients who cancelled by shortage of time were 4.7 times more likely canceled than patients who canceled by patient related reason 95%CI (1.885-11.983)

The second most reasons in our study were management /facility/ related reasons which accounts 53(23.56%) these are lack of ICU beds with mechanical ventilator 14 (26.92%), lack of instrument and medical device 13(25%) and lack of oxygen 10(19.23%) similar study done in American University of Beirut, (19.9 %) (37), in Saudi Arabia 20.3%(46) in Nigeria, 27.6% (33) in Jimma, (21.87%)(35) in Hawassa, 21.2%(36) but study higher when compared to our result were 53% in Bahrain (47) and 67.83% in Uganda (39) were due to facility related factors. the cause of facility related problem was insufficient organization among hospital stakeholders and gap in utilization of scarce resources and long process while in purchase. Patients who cancelled by facility related reason was 3.6 times more likely to be cancelled when compared to patient related cancelation 95%CI (1.049-.12.488)

In our study the third causes of cancellation were medical reasons 41(18.46%) of which the most common were 34.14% hypertension,24.39% Upper Respiratory tract infection,12.9% acute febrile illness and heart problem similar study done in Ghana komfo anokye teaching hospital were 15.5% due to medical problem(32) and in Ethiopia Assella hospital 25% cancelation were medical related (34) in Bahrain most common medical reason were hypertension and upper respiratory tract infection (47)

study done in Nigeria, hypertension and diabetes, recent onset of respiratory tract infections, and acute onset of cardiovascular disorders was commonest reasons(33). Studies higher than to our result was 67.7% in England St Albans city hospital and 32.6% in American university of Beirut cancelation were medical related reason(37,40). Other study done in Saudi Arabia 9.45% due to Medical related reason which is low(42).This problem raises from inadequate preoperative evaluation after admission and poor follow up procedure for those who have medical problem. patients who have medical reasons was 2.9 times more likely cancelled than patients who have had patient related cancelation reason 95%CI (1.085-7.791).

7. Conclusion and recommendation

7.1 Conclusion

The results of our study are in line with the results obtained in literature sources. Based on the results of our study, we concluded that the percentage of elective cases cancelled on the day of surgery would be high however; more than 60 % of observed cancellation was being potentially prevented Which means appropriate steps could contribute to lowering the presence of cancelled elective surgery.

The most common causes of elective surgery cancelations are shortage of time, facility related, Improper scheduling, lack of ICU beds, covid 19 related problem, acute and chronic medical illness, unavailability of operating room equipment and lack of important investigations. Effort should be made to prevent elective surgery cancelation by careful planning and organizing of works in a sustainable way.

In general surgeons took longer than estimated time to finish the procedure since the facility is teaching center however, limit the number of teaching resident's or student and arrange time which is not interfere the operation room efficiency. Share works with responsible and accountable ways for the better outcome of patients and increase operating room efficiency and improve communication among multidisciplinary team. Performed the necessary investigation prior to schedule if the patient with medical problem was detected and appropriate measure would be taken and communicate with concerned staff. Reduce time gap between cases, ensure realistic schedule of patient list and communicate with concerned body before posted.

7.2 Recommendation

We recommend for surgery department every procedure could be set average calculated surgery time and minimize anesthesia preparation time by improving access of anesthesia equipment and supplies as well as available senior personnel. Breakdown activities and resources to accomplish the scheduled cases. Reduce time wastage between surgery and prepared monitoring methods of elective surgery cancelation weekly.

For operation theater staff Manage operation time properly and create smooth communication channel among staffs. Prepared the necessary materials and supplies and make sure the surgery was conducted without any problem. Start early skin incision and reduce time gap between surgeries. Manage scarce resource before outsources.

For anesthesia department assign responsible person for each specialty to evaluate the patient prior to surgery and works toward another multidisciplinary team. Provide the necessary materials nearby attending anesthesia staff and start early anesthesia students teaching.

For policy makers equipped operating room in terms of materials and skilled manpower and evaluate perioperative procedure and make it supported by policy and standards according to our setup. Allocate resources fairly as much as possible and conduct monitoring and evaluation in fixed time interval as well as announce the results to concerned body

Strength of the study

1. we cover all surgery specialty found in the two facility during data collection
2. The study was conducted in two teaching centers.

Limitation of the study

1) Difficulty to generate cause effect relationship between dependent and independent variables, since it is a cross sectional study.
2) The research is done only one season which makes difficult to represent different seasons
3) It is difficult to generalize to the general population because of purposive sampling technique.

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Annex I: Information Sheet and Consent Form
Information sheet

Title of the Research Project

Cancelation of elective surgery and its associated factors in public Teaching hospital of Addis Ababa, Ethiopia, - 2021

Name of Principal Investigator: - Tezazu Engidayehu

Name of the Organization: Addis Ababa University, College of Health Sciences, School of Nursing and Midwifery.

Purpose of the research Project: -

To assess cancelation of elective surgery and its associated factors among public teaching hospitals of Addis Ababa, Ethiopia, 2021

Autonomy: Autonomy of the patients were respected and granted with right of withdraw in the study at any time.

Anonymity: All identification of the participants were kept anonymous; your name was written in this format or any other relevant information which would mention on the data collection forms

Risk and /or Discomfort: There is no social or physical harm when you are participating in this research project except wasting of your time about 10-15 minutes.

Benefits: When you are participating in this research, there may not be a direct benefit to you rather than identifying the reason of cancelation and improves the surgical service.

Confidentiality

All collected data would be kept in a secure place to which only the researcher could have access.

Whom to contact:

This research project will from institutional ethical review board of institute of College of Health Sciences School of Nursing and Midwifery, Addis Ababa University. If you want to know more information, you can contact the following individuals and you may ask at any time you want.

Mr. Tezazu Engidayehu (BSC)

Mobile: +251911030098

Email: nuhamintizazu@gmail.com

Mr. Yohannes Ayalew (Assistant professor)

Email: yayalew58@gamil.com

Mobile: +251911032747

Mr. Debela Gela (assistant professor)

Email: debegela@gmail.com

Mobile: +251913179679

Consent: - Are you willing to participate in the study? Make on a sign your choice

Yes ☐

No ☐

ANNEX II: QUESTIONNAIRE
Addis Ababa University

College of Health Sciences

School of Nursing and Midwifery

Questionnaire prepared to assess the elective surgery and identify its associated factors of cancelation.

Good morning/good afternoon. My name is _____I came from Addis Ababa University College of Health Sciences, School of Nursing and Midwifery. I am working for an investigator doing this thesis for the partial fulfillment of master's degree in perioperative cardiothoracic nursing. You have full right to refuse, withdraw or completely reject part or all of your participation in the study. But I encourage your full participation as the answers you give on this form and your participation are very important to this study and to plan ways to help other people who need surgical intervention.

I would like to assure you that all of your responses to our questions would be kept confidential throughout the study process. Any of your information you provide could be used only by the research team and will, by no means, be revealed to a third party. I would ask you questions in a place where other people or conditions couldn't interfere. I would like to assure you that your participation on this research would not affect any of your treatment and other benefit that you get from any organization. The questions would take 10-15 minutes. May I get your permission to continue my interview?

Do you agree to participate in the study?

1. Yes, thank you conducts the interview.

2 If no, escape to the next participant.

You may ask questions now and, in the future, if you do not understand something that is being done. Here are addresses of individuals who you can contact:

Mr. Tezazu Engidayehu Phone No +2519-11-03-00-98 email; nuhamintizazu@gmail.com

1 – If yes, proceed to the interview. 2 – If no, skip to the other participant

If yes, Study participant's Unique ID No. _____ Signature ____ Date_____

Data collector's Name _____ signature _____

Supervisor's Name _____signature_____

Informed consent Certified by:

Signature/finger print of the participant

Signature/finger print _____ date _____

(Proceed with the interview)

No ☐ (Terminate the interview)

Interviewer

Name _____ Signature _____ date _____

Supervisors

Name _____ Signature _____ date _____

Address of the principal investigator: Cell phone: 0911030098

Questionnaire

s. n	I. Patient identification	
101	Medical record number	
102	Name of Hospital	
103	Age	
104	Sex	1. Male 2. Female
105	Department (specialty)	
106	Planned procedure	
107	How many cases are scheduled (in case of case canceled specialty)	
108	Today's operation canceled?	1. No 2. Yes
109	Place of cancellation for current procedure	1. Before entering the OR 2. After entering the OR
110	Was the operation previously cancelled?	1. Yes 2. No
	II. Factors for cancellation	
201	Patient related	1. Uncontrolled /acute medical illnesses 2. Lack of important investigation 3. Patient refusal/request 4. Poor gut preparation 5.Financial shortage 6. Absence from the OR 7. Patient not fasting 8. Patient on medication 9.Others (specify)----------

Questionnaire

s. n	Factors for cancelation	
202	Uncontrolled or acute medical illnesses	1. High blood pressure/ Hypertension/. 2. Uncontrolled DM 3. Uncontrolled asthma 4. IHD (ischemic heart disease) 5. Uncontrolled Thyroid disease 6. AFI (acute febrile illness) 7. URTI (upper respiratory tract infection) 8. Others----------
203	Lack of important investigation	1. Hematocrit 2. Electrolytes 3. Liver function test 4. Pulmonary function test 5. Electrocardiogram 6. Renal function test 7. X-RAY/CT SCAN
204	Management /facility/ related	1. Shortage of OR material 2. Power breakdown 3. Lack of ICU bed or mechanical ventilator 4. Shortage of water supply 5. Blood not prepared 6. Lack of Oxygen source 7. Lack of sterile material due to autoclave malfunction 8. Others (specify)……

s. n	Factors for cancelation	
205	Staff related	1. Surgeon 2. Anesthesia provider 3. Nurse 4. OR pharmacist 5. Other staff (specify)----------
206	Shortage of time	1. Previous case prolonged 2. Emergency priority 3. Over scheduling 4. late skin incision
207	Unexpected emergency	1. Cardiac arrest 2. Aspiration on the OR table 3. Failed intubation/spinal
208	COVID-19 related	1. due to covid-19 positive result 2. due to covid-19 result not available or missed 3. Lack of PPE to perform covid-19 infected patient 4. Old Covid 19 result

Data collector

Name ---------- Signature ---------- Date----------

አማርኛ ቃለ መጠይቅ

አዲስ አበባ ዩንቨርሲቲ ጤፍ ሳይንስ ኮሌጅ

የነርሶች እና አዋላጅ ነርስ ት/ቤት

በመንግስት የጤፍ ተቋማት ት/ቤት ወስጥ በቀዶ ጥገና አገልግሎት ሙያዘመ ወይምአለማኅራት እና ምክኒያቶች ቃለማጠይቅ 2013 አ.ም

ህመማን በጥናቱ ለመሳተፍ ፍቃደኛ ስለመሆናቸዉ የሚለፅበት ፎርም

እንደምን ሰነበቱ?የእኔ ስም----------ይባላል በአዲስ አበባ ዩንቨርሲቲ በሚረገዉበዚህ ጥናት ወስጥ ተሳታፊ ስሆን እርሶዎ በዚህ ሆስፒታል የቀዶ ህክምና አገልግሎት ሲያገኙ ስለሚ ጥሞዎት የአገልገሎት ሙሉዘመ ቃለ ማጠይቅ አደርግሎታለሁ፡ ፡ የዚህ ጥናት አላማየ ተሟሏ አገልግሎት ወይምአነስተኛ የመሙዘምሂደት እንዲኖር ማድረግ ነዉ፡ ፡ ለአላማዉመሳካት ትብብር እንሻለን የእርሶዎ ስምምሆነ አድራሻ በማጠይቁ አይካተትምእንዲሁምየእርስዎ ማንነትምሆነ የሰጠኑ ምላሽ የእርሶዎ ስለመሆኑ በምንምሁኔታ አይገለፅም፡ ፡ በዚህ ጥናት ለመሳተፍ የእርሶዎን መሉ ፍቃደኝነት ስንጠይቅ ያለ ምንምአስገዳጅነት ሲሆን ፍቃደኛ ካልሆኑ ከመጀመሪያወም ሆነ ቃለ ማጠይቁን ከጀመሩምበኃላ ከመልላይ ማቋረጥ ይችላሉ፡ ፡

በጥናቱ ለመሳተፍ ፍቃደኛ ነዎ? 1. አዎ 2. አይደለሁም

1. ፈቃደኛ መሆናቸዉን ካረጋገጠበኃላ ቃለ ማጠይቁን ይጀምሩ፡ ፡
2. ፍቃደኛ ካልሆኑ ምክኒያቱ ይገለፅ ----------
3. በመቀጠል ወደ ማቋጥለዉሕመምተኛ ይሂዱ፡ ፡

ቃለ ማጠይቁ

የተደረገበት ቀን ----------የተጀመረበት ሰአት ----------ያለቀበት ሰአት----------

የተቆጣጣሪዉስም----------ፊርማ----------

ቃለ ማጠይቅ

ተ.ቁ	**1. የታካሚዉመረጃ**	
101	ካርድ ቁጥር	
102	የ ሆስፒታሉ ስም	
103	እድሜ	
104	ፆታ	1.ወንድ 2. ሴት
105	ቀዶ ጥገና ዉየ ሚከናዎንበት ክፍል	
106	ሊሰራ የ ታቀደዉየ ቀዶ ጥገ ና አይነ ት	
107	በክፍሉ ዉስጥ ሊሰሩ የ ታቀዱ ታካሚዎች ቁጥር	
108	ከዚህ በፊት ታቅዶ ተሰርዞ (ተራዝሞ) ያዉቃል ?	1. አዎ 2. አይ
109	የ ዛሬዉቀዶ ጥገ ና መሰረዙ(መራዘሙ)የ ተነ ገ ረዎት የ ት ነ በር ?	1. ቀዶጥገ ና ክፍል ዉስጥ ከገ ባ በኃላ 2. ቀዶ ጥገ ና ክፍል ከመግባቱ በፊት
	2. ቀዶ ጥገ ናዉ የ ተሰረዘበት ምክኒያት	
201	ከታካሚዉጋር ተያያዝነ ት ያላቸዉችግሮች	1.ከቁጥጥር ወጪያ ሆኑ ህመሞች 2.አስፈላጊ ምርመራ አለ ማግኘት 3. ታካሚዉበህክምና ዉሳይስ ማማሲቀር 4.ቅድመዝግጅት አለ ሚድረግ 5.የ ገ ንዘብ እጥረት 6.በድን ገ ት ከቀደጥገ ና ክፍል መጥፉት 7.ምግብ አለ መዋ ም 8.መድህኒ ት ላይ መሆን 9.ሌላ ካለ ይገ ለፅ ----------

202	ከቁጥጥር ወጪያ ሆኑ በሽታዎች	1.የ ደ ም ግ ፊ ት 2.የ ስ ኳ ር ህ መ ም 3.የ ል ብ ች ግ ር 4.የ እ ን ቅ ር ት በ ሽ ታ ች ግ ር 5.ድ ን ገ ተ ኛ ህ መ ም 6.የ ላ ይ ኛ ው የ መ ተ ን ፈ ሻ አ ካ ል በ ሽ ታ 7.ሌ ሎ ች ካ ሉ ይ ጥ ቀ ሱ_____
203	የ ተ ሟ ሟ ምር መ ራ አ ለ ሚ ድ ረ ግ	1. ቀ ይ የ ደ ም ሴ ል ምር መ ራ 2.በ ሰ ወ ነ ት ው ሥ ጥ የ ሚ ኙ ን ጥ ረ ነ ገ ሮ ች ምር መ ራ 3. የ ጉ በ ት ምር መ ራ 4.የ ሳ ን ባ ምር መ ራ 5. የ ል ብ ምር መ ራ 6.የ ኩ ላ ሊ ት ምር መ ራ 7.የ ኤ ክ ሥ ሬ እ ና ሚ ቲ ስ ካ ን ምር መ ራ
204	የ አ ስ ተ ዳ ድ ራ ዊ ች ግ ሮ ች	1.የ ህ ክ ም ና ቁ ሳ ቁ ስ እ ጥ ረ ት 2.የ ሀ ይ ል እ ጥ ረ ት 3.የ ደ ም እ ጥ ረ ት 4.የ አ ክ ሥ ጅ ን እ ጥ ረ ት 5.የ ወ ሀ እ ጥ ረ ት 6. የ ጽ ኑ ህ መ ማ ን አ ል ጋ እ ና ማ ሽ ን እ ጥ ረ ት 7. የ ተ ቀ ቀ ሉ (ለ ስ ራ ዝ ግ ጁ የ ሁ ኑ ማ ሪ ያ ቁ ሳ ቁ ሶ ች እ ጥ ረ ት)እ ና የ አ ወ ቶ ክ ሌ ብ ብ ል ሽ ት 8. ሌ ሎ ች ካ ሉ ይ ጥ ቀ ሱ_____

205	የ ባለ ሞያ እ ጥረት	1. የ ሀ ኪም እ ጥረ ት 2. የ ሰ መመ ን ባለ ሞያ እ ጥረ ት 3. የ ነ ር ስ እ ጥረ ት 4. የ ፋ ር ማ ሺ እ ጥረ ት 5. ሌ ሎ ች ካ ሉ ይ ጥ ቀ ሱ_____
206	በ ቂ ሰ አ ት ያ ለ መ ኖ ር (የ ጊ ዜ እ ጥረ ት)	1.የ መ ጀ መ ሪ ያ ዉ ቀ ዶ ጥ ገ ና መ ራ ዘ ም 2.ድ ን ገ ተ ተ ኛ ታ ካ ሚ መ ኖ ር 3.የ ታ ቀ ደ ዉ ቀ ዶ ጥ ገ ና እ ቅ ድ ቁ ጥ ር መ በ ዛ ት 4. ዘ ግ ይ ቶ ቀ ዶ ጥ ገ ና ዉ ን መ ጀ መ ር
207	ያ ል ታ ሰ በ (ድ ን ገ ተ ኛ) የ ጠ ፍ ች ግ ር	1.የ ል ብ ም ት መ ቆ ም 2.በ አ የ ር ቧ ን ቧ ዉ ስ ጥ ባ እ ድ ነ ገ ር ሲ ኖ ሩ የ ሚ ፈ ጠ ር ች ግ ር (ት ን ታ) 3.ለ ሚ ደ ን ዘ ዝ ሳ ይ ቻ ል ሲ ቀ ር
208	ከ ኮ ቪ ድ ጋ ር በ ተ ያ ያ ዘ የ ተ ራ ዘ መ ቀ ዶ ጥ ገ ና	1. በ ኮ ቪ ድ መ ያ ዝ 2. የ ም ር መ ራ ዉ ጣ ቋ መ ዛ ግ የ ት 3. . የ ኮ ቪ ድ የ ተ ያ ዘ ታ ሞ ሚ ለ መ ከ ራ ት የ ሚ ያ ስ ል ግ ቁ ሳ ቁ ስ እ ጥ ረ ት 4. ጊ ዜ ዉ ያ ለ ፈ በ ት ዉ ጣ ቋ (ሁ ለ ት ሳ ምን ት ና ከ ዚ ያ በ ላ ይ)

መ ረ ጃ ዉ ን የ ሚ ሰ በ ሰ በ ዉ

ባ ለ ሞ ያ ስ ም ---------- ፊ ር ማ ---------- ቀ ን ----------