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Impact of Preoperative Cardiology Consultation on Perioperative Complications in Elective Non-Cardiac Major Surgery: A Comparative Study at a Tertiary Care Hospital

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Declaration

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ABSTRACT

Background: Perioperative complications pose significant risks for patients undergoing elective major non-cardiac surgery, particularly those with pre-existing cardiovascular risk factors. These problems may lead to increased morbidity, extended hospitalizations, and greater healthcare expenditures. Consequently, identifying techniques to mitigate perioperative hazards has emerged as a priority in clinical settings. **Objective:** To compare the frequency of perioperative complications in patients who received and did not receive cardiology consultation prior to undergoing non-cardiac elective surgery at a tertiary care hospital. **Method:** A Descriptive Study was conducted at the Department of Anesthesiology, The Indus Hospital, Karachi, Pakistan, for six months after the approval of the synopsis from March 26, 2021, to September 26, 2021. All patients meeting the inclusion criteria were included. Informed consent was obtained after explaining the procedure, risks, and benefits. A brief history for demographic data like age and gender was recorded, and perioperative complications were assessed on the third postoperative day. Data were electronically stored for research purposes. **Results:** The age of patients ranged from 36 to 70 years, with a median of 57 and an interquartile range of 14 (C.I 53.94–56.93). Among them, 91 (61.1%) were male, and 58 (38.9%) were female. Acute coronary syndrome was found in 8 (5.4%), arrhythmia in 9 (6.0%), while no patients had acute heart failure. No significant difference was observed between those who received cardiology consultation and those who did not (P-Value: 0.133 & 0.086). **Conclusion:** No significant difference was noted among patients who received and did not receive cardiology consultation before non-cardiac elective surgery.

INTRODUCTION

Preoperative medical consultations are an important component in the care of patients undergoing elective surgery [1]. Patients who are at high risk of morbidity and mortality due to pre-existing co morbidities which targeted for preoperative are targeted for perioperative medical consultations by preoperative physicians or anesthesiologist [2]. For preoperative risk evaluation and modification, preoperative assessment is widely introduced to obtain information about the patient's state of health and to collect data on previous treatments [3]. Such consultations involve optimizing pre-existing medical conditions; assessing and managing risk of morbidity; initiating interventions intended to decrease perioperative risk and where appropriate, recommending the deferment or cancellation of surgery [4,5]. The ultimate goals of preoperative assessment are to evaluate perioperative risk, optimize patient status and to reduce the patient's surgical and anesthetic morbidity or mortality [6]. Forty two percent of the overall complications in non-cardiac surgery are caused by cardiac complications, the cardiologist is still the most frequently consulted specialist in the preoperative workup [7]. The relevance of preoperative consultations has been disputed. While usefulness is described by

some studies and others report an overuse of preoperative cardiac consultation and claim that these consultations gave little advice that truly impacts management [8,9]. Unfortunately, most of these studies have significant limitations, as they were performed before the introduction of widely accepted guidelines, before the implementation of preoperative consultation by the anesthesiologist in an outpatient clinic and investigated patients were often referred by the surgeons themselves [10]. Unnecessary and inappropriate preoperative tests and procedures are often expensive time consuming and may create medico legal problems [11]. With increasing patient age and complexity of medical conditions, there is a need for comprehensive preoperative evaluation and medical optimization to enable the anesthetist and surgeon to deliver the best surgical outcome [12,13]. Study conducted by Dovgan et al enrolled 1880 patients who undergoing elective non-cardiac major surgeries. Out of 1880 patients, 680 (36.1%) received preoperative cardiology consultation and 1200 (63.8%) didn't receive preoperative cardiology consultation. During perioperative period wound infection was observed in 125/1880 (6.64%), acute coronary syndrome 64/1880 (3.40%), acute heart failure 52/1880 (2.76%), arrhythmia 41/1880 (2.18%) and death 24/1880 (1.27%) patients.

In this study perioperative complications were also compared with preoperative cardiology consultation; wound infection (6.5% vs 6.7%), acute coronary syndrome (3.6% vs 3.3%), acute heart failure (2.5% vs 2.9%), arrhythmia (2.2% vs 2.2%) and death (1.2% vs 1.3%) [14].

This aim of our study is to determine the frequency of perioperative complications and compare the frequency of perioperative complications in patients who received and did not receive cardiovascular consultation prior to undergoing non-cardiac elective surgery in order to establish the local perspective as there is paucity of local data. During preoperative assessment, consultation is common and might modify the outcome if further information leads to a different anesthetic regime or if interventions are performed based on further assessment. If no change in management is needed it can lead to unnecessary and potentially harmful investigations and furthermore may delay surgery. Due to limited health resources in our country and an increase in the cost of healthcare, determining disease prognosis is vital. Moreover, data from this study would help to avoid unnecessary preoperative consultations.

METHODS

A descriptive study was performed at the Department of Anaesthesiology at The Indus Hospital, Karachi, spanning a six-month period from March 26, 2021, to September 26, 2021, subsequent to the approval of the study The sample size was determined using the WHO sample size calculator, accounting for a 6.64% prevalence of wound infection[14], a 4% margin of error, and a 95% confidence interval, yielding a necessary sample size of 149 patients. A non-probability consecutive sampling method was utilised. Individuals aged 30 to 70 years, of either gender, undergoing non-cardiac elective surgeries—specifically head and neck, prostate, intrathoracic, major gynaecological cancer, gastrointestinal, major transurethral or open urological surgeries, and hip or knee arthroplasty—classified as ASA 2, 3, or 4, and who provided informed consent, were included. Patients with a history of hepatitis B, C, or HIV infection; tuberculosis; chronic obstructive pulmonary disease; asthma; or chronic liver disease were excluded, along with pregnant patients, as determined by medical history and dating scan, and those undergoing cardiac or vascular surgeries, including open-heart or vascular graft procedures, or any emergency surgeries.

Approval from the Institutional Review Board (IRB) was obtained prior to commencing the study. Eligible subjects were recruited following informed consent. Height (in meters) and weight (in kilogrammes) were assessed using standardised instruments, and BMI was computed upon admission. Demographic information, including age and gender, was documented, and perioperative problems, as delineated in the operational criteria, were evaluated on the third postoperative day. Quantitative variables, such as age, height, weight, and BMI, were assessed, whereas qualitative variables, including gender, residential status, type II diabetes mellitus, dyslipidaemia, hypertension, smoking status, obesity status, and perioperative complications (acute coronary syndrome, arrhythmia, and acute heart failure), were recorded in a structured proforma.

Data were analysed utilising SPSS Version 24. Means and standard deviations or medians and interquartile ranges were computed for quantitative variables, with normality evaluated using the Shapiro-Wilk test. Frequencies and percentages were computed for qualitative variables. The Chi-square/Fisher exact test was utilised to compare perioperative problems with preoperative cardiology consultations. Effect modifiers such as age, gender, residential status, BMI, type II diabetes mellitus, dyslipidaemia, hypertension, smoking status, and obesity status were managed via stratification. Following post-stratification, statistical significance was assessed using the Chi-square/Fisher exact test, with a significance threshold established at $p < 0.05$.

RESULTS

This study comprised 149 participants to assess perioperative complications in persons receiving elective major non-cardiac surgery. The main aim was to compare these complications between patients who underwent preoperative cardiology consultation and

those who did not, in a tertiary care facility. The results are encapsulated as follows: The Shapiro-Wilk test was employed to evaluate the distribution of continuous variables. Marked non-normality was detected in variables including age (P=0.0001), weight (P=0.018), height (P=0.0001), and body mass index (P=0.029), as illustrated in Table 1. In terms of gender distribution, 91 patients (61.1%) were male, and 58 patients (38.9%) were female, as illustrated in Figure 1. Of the whole cohort, 79 patients (53%) lived in metropolitan settings, whereas 55 (47%) were from rural regions, as illustrated in Figure 2. Diabetes mellitus was diagnosed in 81 patients (54.4%), as depicted in Figure 3, while dyslipidaemia was observed in 73 patients (49%), as represented in Figure 4. Smoking behaviours were recorded, revealing that 51 patients (34.2%) were classified as smokers, while 98 patients (65.8%) were categorised as non-smokers (Figure 5). Furthermore, 78 patients (52.3%) were categorised as obese, whereas 71 (47.7%) were categorised as non-obesity, as illustrated in Figure 6. Hypertension was a common comorbidity, identified in 140 patients (94%), as outlined in Table 6. Additionally, a preoperative cardiology consultation was obtained by 75 patients (50.3%), whereas 74 patients (49.7%) did not receive this consultation, as illustrated in Figure 7. Acute coronary syndrome (ACS) was diagnosed in 8 patients (5.4%), and arrhythmias were recorded in 9 individuals (6.0%). Significantly, no instances of acute cardiac failure were documented in this study sample (0.0%). No occurrences of acute cardiac failure were noted in either group. The results are encapsulated in Table 2.

The correlation between preoperative cardiology consultation and perioperative problems was examined. Of the patients with wound infections, 10 (6.7%) had undergone cardiology consultation, while 14 (9.4%) had not, with no statistically significant difference seen (P = 0.354). In the case of ACS, 2 patients (1.3%) who underwent cardiology consultation and 6 patients (4.0%) who did not encounter this problem (P = 0.133). Among patients with arrhythmias, 7 individuals (4.7%) who received consultation and 2 individuals (1.3%) who did not were affected, with the difference nearing but not achieving statistical significance (P = 0.086).

Table 3 examined perioperative problems in patients receiving elective non-cardiac major surgery, emphasising cardiology consultations and patient characteristics. Arrhythmias (6.0%) were prevalent consequences, although no instances of acute heart failure were recorded. Arrhythmias occurred more frequently in people with obesity and diabetes. The cardiology consultation revealed no statistically significant effect on problems. Gender, age, hypertension, smoking, and dyslipidaemia exhibited trends but did not achieve statistical significance. The results underscore the necessity of managing modifiable risk variables and preoperatively stratifying patients to reduce problems.

Table 1

Descriptive Statistics for Distribution of Continuous Variable n=149

Variables	Mean±SD	P-Value
Age (years)	55.44±9.23	0.0001
Weight (kg)	80.47±7.92	0.018
Height (Meter)	1.65±0.057	0.0001
BMI (kg/m^2)	29.69±2.87	0.029

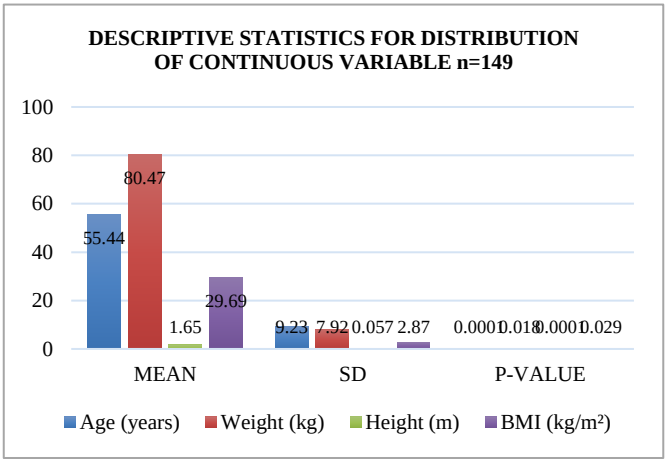

Figure 1

Frequency of Gender n=149

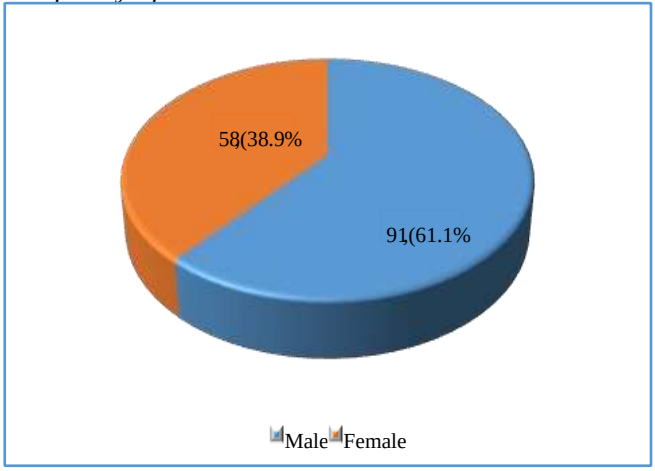

Figure 2

Frequency of Residential Status n=149

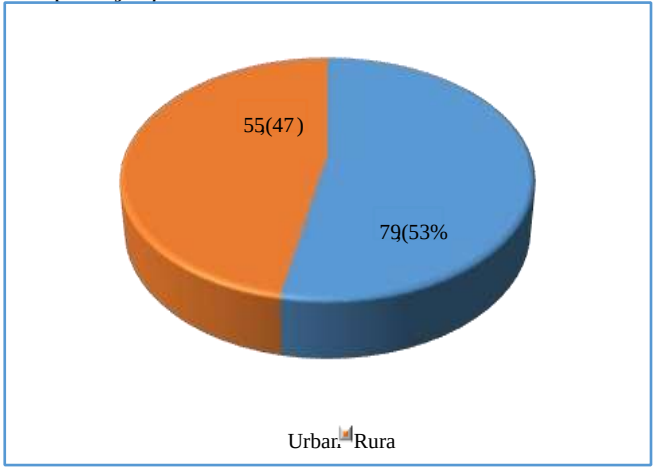

Figure 3

Frequency of Diabetes Mellitus Type II n=149

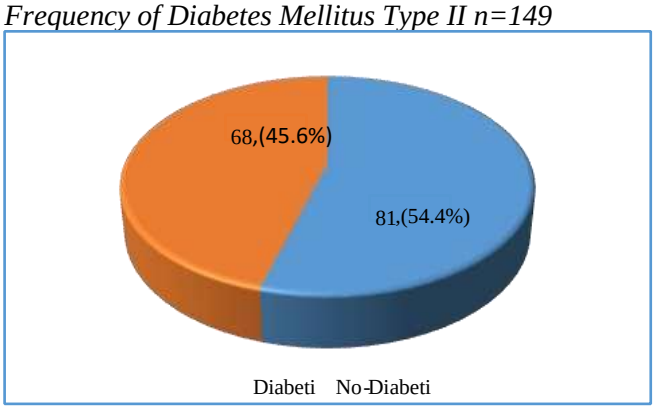

Figure 4

Frequency of Dyslipidemia n=149

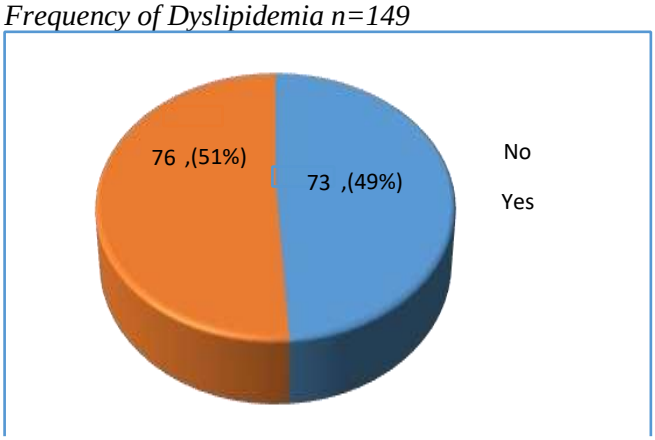

Figure 5

Frequency of Smoking Status n=149

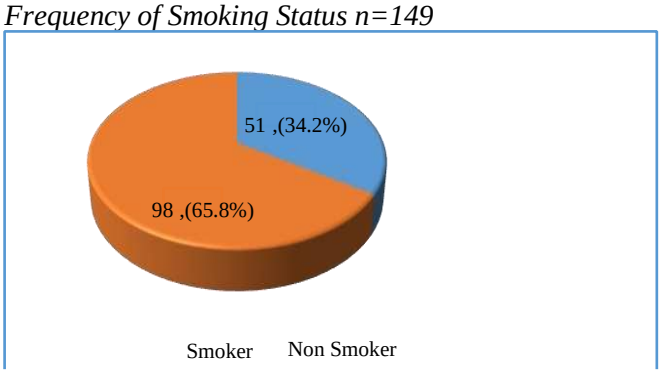

Figure 6

Frequency of Obesity Status n=149

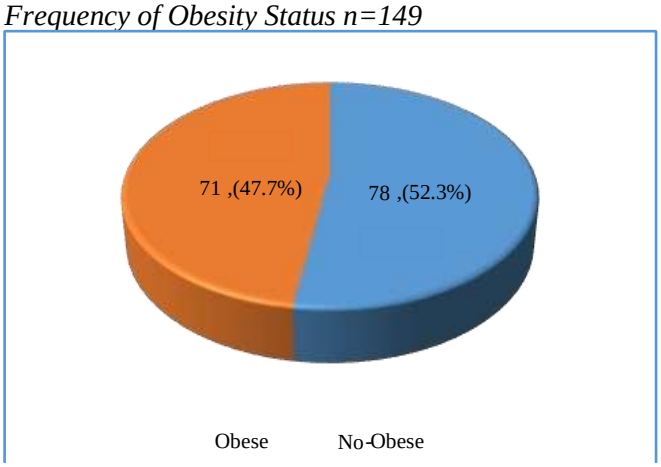

Figure 7

Frequency of Cardiology Consultation n=149

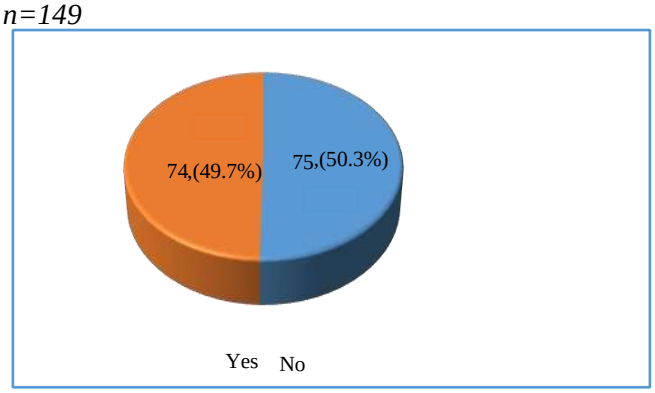

Table 2

Prevalence of Hypertension and Perioperative Complications n=149

Hypertension	**Frequency**	**Percentage**
Hypertensive	140	94%
Non-Hypertensive	9	6.0%
Acute Coronary Syndrome	**Frequency**	**Percentage**
Yes	8	5.4%
No	141	94.6%
Arrhythmia	**Frequency**	**Percentage**
Yes	9	6.0%
No	140	94.0%
Acute Heart Failure	**Frequency**	**Percentage**
Yes	0	0.0%
No	149	100.0%

Table 3

*Impact of Clinical and Demographic Factors on Perioperative Complications n=***149**

Perioperative Complications		**Cardiology Consultation**		**P-value**
		Yes	**No**	
Acute Coronary Syndrome	Yes	2 (1.3%)	6 (4.0%)	0.133
	No	73 (49.0%)	68 (45.6%)	
Arrhythmia	Yes	7 (4.7%)	2 (1.3%)	0.086
	No	68 (45.6%)	72 (48.3%)	
Acute Heart Failure	Yes	0 (0.0%)	0 (0.0%)	N/A
	No	75 (50.3%)	74 (49.7%)	
Perioperative Complications		**Age Group** [In Years]		**P-value**
		30 – 50	**>50**	
Acute Coronary Syndrome	Yes	3 (2.0%)	5 (3.4%)	0.454
	No	42 (28.2%)	99 (66.4%)	
Arrhythmia	Yes	2 (1.3%)	7 (4.7%)	0.454
	No	43 (28.9%)	97 (65.1%)	
Acute Heart Failure	Yes	0 (0.0%)	0 (0.0%)	N/A
	No	45 (30.2%)	104 (69.8%)	
		Gender		

Perioperative Complications		Male	Female	P-value
Acute Coronary Syndrome	Yes	3 (2.0%)	5 (3.4%)	0.151
	No	88 (59.1%)	53 (35.6%)	
Arrhythmia	Yes	5 (3.4%)	4 (2.7%)	0.491
	No	86 (57.7%)	54 (36.2%)	
Acute Heart Failure	Yes	0 (0.0%)	0 (0.0%)	N/A
	No	91 (61.1%)	58 (38.9%)	
Perioperative Complications		**Residential Status**		**P-value**
		Urban	**Rural**	
Acute Coronary Syndrome	Yes	6 (4.0%)	2 (1.3%)	0.181
	No	73 (49.0%)	68 (45.6%)	
Arrhythmia	Yes	6 (4.0%)	3 (2.0%)	0.311
	No	73 (49.0%)	67 (45.0%)	
Acute Heart Failure	Yes	0 (0.0%)	0 (0.0%)	N/A
	No	79 (53.0%)	70 (47.0%)	
Perioperative Complications		**BMI [in kg/m^2]**		**P-value**
		23 – 28	**>28**	
Acute Coronary Syndrome	Yes	1 (0.7%)	7 (4.7%)	0.271
	No	42 (28.2%)	99 (66.4%)	
Arrhythmia	Yes	1 (0.7%)	8 (5.4%)	0.208
	No	42 (28.2%)	98 (65.8%)	
Acute Heart Failure	Yes	0 (0.0%)	0 (0.0%)	N/A
	No	43 (28.9%)	106 (71.1%)	
Perioperative Complications		**Diabetes Mellitus**		**P-value**
		Diabetic	**Non-Diabetic**	
Acute Coronary Syndrome	Yes	4 (2.7%)	4 (2.7%)	0.539
	No	77 (51.7%)	64 (43.0%)	
Arrhythmia	Yes	8 (5.4%)	1 (0.7%)	0.031
	No	73 (49.0%)	67 (45.0%)	
Acute Heart Failure	Yes	0 (0.0%)	0 (0.0%)	N/A
	No	81 (54.4%)	68 (45.6%)	
Perioperative Complications		**Hypertension**		**P-value**
		Hypertensive	**Non-Hypertensive**	
Acute Coronary Syndrome	Yes	8 (5.4%)	0 (0.0%)	0.600
	No	132 (88.6%)	9 (6.0%)	
Arrhythmia	Yes	9 (6.0%)	0 (0.0%)	0.562
	No	131 (87.9%)	9 (6.0%)	
Acute Heart Failure	Yes	0 (0.0%)	0 (0.0%)	N/A
	No	140 (94.0%)	9 (6.0%)	
Perioperative Complications		**Dyslipidemia**		**P-value**
		Yes	**No**	
Acute Coronary Syndrome	Yes	4 (2.7%)	4 (2.7%)	0.618
	No	69 (46.3%)	72 (48.3%)	
Arrhythmia	Yes	7 (4.7%)	2 (1.3%)	0.074
	No	66 (44.3%)	74 (49.7%)	
Acute Heart Failure	Yes	0 (0.0%)	0 (0.0%)	N/A
	No	73 (49.0%)	76 (51.0%)	
Perioperative Complications		**Smoking Status**		**P-value**
		Smoker	**Non-Smoker**	
Acute Coronary Syndrome	Yes	2 (1.3%)	6 (4.0%)	0.443
	No	49 (32.9%)	92 (61.7%)	
Arrhythmia	Yes	4 (2.7%)	5 (3.4%)	0.370
	No	47 (31.5%)	93 (62.4%)	
Acute Heart Failure	Yes	0 (0.0%)	0 (0.0%)	N/A
	No	51 (34.2%)	98 (65.8%)	
Perioperative Complications		**Obesity Status**		**P-value**
		Obese	**Non-Obese**	
Acute Coronary Syndrome	Yes	6 (4.0%)	2 (1.3%)	0.171
	No	72 (48.3%)	69 (46.3%)	
Arrhythmia	Yes	8 (5.4%)	1 (0.7%)	0.024
	No	70 (47.0%)	70 (47.0%)	
Acute Heart Failure	Yes	0 (0.0%)	0 (0.0%)	N/A
	No	78 (52.3%)	71 (47.7%)	

DISCUSSION

Patients undergoing noncardiac surgery have the risk of significant perioperative cardiovascular events [15]. The conventional method to mitigate perioperative cardiovascular problems involves evaluating risk based

on the kind of surgery and a clinical assessment of cardiac risk. Patients undergoing vascular surgery are deemed to be at elevated risk, with a cardiovascular risk frequently exceeding 5% [16]. A preoperative cardiology consultation (CC) may significantly contribute to the prevention of perioperative cardiovascular events in patients undergoing vascular surgery. Nonetheless, the yield of cardiac consultation prior to noncardiac, nonvascular surgery (NCNVS), characterised by perioperative morbidity rates between 1% and 5% (intermediate-risk surgery), remains undetermined [16]. The efficacy of CC, regarding new therapy or substantial impact on patient care plan, has been documented to fluctuate significantly from 10% to over 70% [17-19]. Superfluous and unsuitable preoperative examinations and procedures are frequently costly, timeintensive, and may result in medico-legal complications. The present guidelines strive to minimize needless preoperative tests and identify patients with cardiovascular risk factors; however, they do not specify when anaesthesiologists or surgeons should visit cardiologists or the benefits of such consultations.

Preoperative cardiovascular clearance is frequently solicited by surgeons and/or anaesthesiologists for patients with established or suspected cardiovascular conditions undergoing noncardiac surgery. Nonetheless, prior research indicates that CC is over utilised [17-19].

While numerous studies have explored the preoperative evaluation system and perioperative outcomes in highrisk vascular surgery patients, there is a scarcity of reports assessing the efficacy of preoperative cardiac clearance in forecasting postoperative cardiovascular events in patients undergoing intermediate-risk nonvascular surgery. Katz et al. [17] conducted a retrospective evaluation of data from 55 consecutive patients over the age of 50 who underwent preoperative cardiac consultations to assess the objectives of the consultation and the agreement between surgeons, anaesthesiologists, and cardiologists. Forty percent of the CCs had no advice aside from "cleared for surgery," "proceed with case," or "continue current medications." They determined that the majority of the CCs are ineffective.

Kleinman et al. conducted a retrospective analysis of 202 preoperative CC cases [18]. Out of 189 individuals, 52 underwent a modification in preoperative therapy, while the rest 137 maintained their preoperative regimen unchanged. Perioperative cardiovascular problems were not substantially more prevalent in patients who underwent a change in preoperative therapy (13.4% compared to 7.3%, respectively). Katz et al. [21] examined

146 physician consultations that included chief complaints (CC). It was determined that the consultant

identified a novel finding in merely 3.4% of the consultations, whereas 42.5% of the consultations had no recommendations. The elevated prevalence of preoperative comorbidities and advanced age in these patients are the primary factors contributing to the rise in cardiovascular problems.

In patients with risk factors undergoing high-risk surgery, randomised trials and cohort studies demonstrated a reduction in cardiovascular events with beta blockers [22-24]. Nevertheless, in patients devoid of clinical risk factors, existing evidence indicates that perioperative beta-blockade medication does not mitigate the risk of cardiovascular problems and may potentially exacerbate this risk [25,26]. The efficacy of perioperative betablocker medication in patients undergoing intermediate surgical risk remains uncertain; nonetheless, most patients with stable cardiac conditions and controlled heart rates can proceed with these procedures without further assessment [27]. In our study, 91 participants (61.1%) were male, whereas 58 participants (38.9%) were female. Dogan V, et al reported 358 males (52.7%) and 322 females (47.3%) [14].

This study recorded diabetes mellitus in 81 patients, constituting 54.4% of the sample. Dogan V, et al.

additionally observed diabetes in 174 (25.6%) instances [14]. The current study identified dyslipidaemia in 73 (49%) participants. Dyslipidaemia was observed in 248 patients, constituting 36.4% of the cohort [14]. This study indicated that among 149 patients, 51 (34.2%) were smokers, whereas 98 (65.8%) were non-smokers. The findings of Dogan V, et al, indicated that there were 84 smokers, constituting 12.4% of the sample. A recent investigation identified hypertension in 140 (94%) subjects. Dogan V, et al reported 375 hypertensive patients, constituting 55.2% [14]. This investigation indicated that acute coronary syndrome was identified in 8 (5.4%) participants. Dogan V, et al. reported acute coronary syndrome in 24 cases (3.6%) [14].

Our investigation indicated that arrhythmia was detected in 9 (6%) participants. Dogan V, et al. further observed arrhythmia in 15 instances (2.2%) [14]. The present investigation determined that acute cardiac failure was observed in 0 (0%) of the patients. Heart failure was recorded in 5 (0.7%) patients [14]. Preoperative coronary artery revascularisation did not diminish the incidence of mortality and nonfatal myocardial infarction in patients receiving vascular surgery [28]. While the efficacy of preoperative cardiac testing or

revascularisation in nonvascular surgery patients remains inadequately researched, the ineffectiveness observed un vascular surgery patients may be extrapolated to NCNVS.

Preoperative CC in patients undergoing intermediate-risk NCNVS did not influence perioperative care or surgical outcomes. Additional randomised, prospective studies on the efficacy of preoperative CC should be conducted in patients receiving intermediate-risk NCNVS. Additional study is necessary to enhance the understanding of cardiology consultations that impact non-cardiac elective surgery. This will allow us to implement novel therapeutic and diagnostic methods that potentially decrease the mortality rate associated with perioperative problems.

CONCLUSION

In conclusion, no statistically significant association between preoperative cardiology consultations and perioperative problems, including acute coronary syndrome or arrhythmias. Complications were significantly more common in people with obesity, diabetes, and those living in rural areas. Although there were no instances of abrupt cardiac failure, the findings highlight the essential requirement for addressing modifiable risk factors and using personalised preoperative risk assessment techniques to reduce complications and enhance surgical outcomes.

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