The Egyptian Journal of Hospital Medicine (April 2024) Vol. 95, Page 1630- 1636

Detection of Preoperative Cardiac Abnormalities in Asymptomatic Patients Undergoing Low to Intermediate Risk Non-Cardiac Surgery

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ABSTRACT

Background: In patients having non-cardiac surgery, perioperative cardiovascular problems constitute the primary contributor to both morbidity and death.

Objective: Uncovering hidden cardiac problems among asymptomatic patients that may cause complications during and after low to intermediate risk non-cardiac surgery.

Subjects and Methods: The study was conducted on 300 cases; and all of them were subjected to full preoperative cardiac assessment including full history taking, clinical examination, laboratory investigations, 12-lead surface ECG and transthoracic echocardiography to exclude any case with significant heart disease. All patients were followed up during hospital stay for assessment of perioperative complications.

Results: Regarding incidence of complications and types of cardiac complications distribution among study groups, 275 patients (91.7%) had no complications and 25 patients (8.3%) had complications in the form of: sinus tachycardia (5 patients "1.7%"), hypotension (4 patients "1.3%"), Supra ventricular tachycardia (4 patients "1.3%"), arrested (3 patients "1.0%"), venous thrombosis (3 patients "1.0%"), Atrial fibrillation (2 patients "0.7%"), pulmonary embolism (2 patients "0.7%"), acute pulmonary edema (one patient "0.3%") and suspected pulmonary embolism (one patient "0.3%").

Conclusion: There was a statistically significant increase in postoperative complications among cardiac patients who did not exhibit any symptoms. The clinical and predictive use of routine preoperative electrocardiography (ECG) and echocardiography (ECHO) in persons having low- to intermediate-risk surgery for major cardiac adverse events is limited.

Key words: Asymptomatic Cardiac Abnormalities; Non-Cardiac Surgery

INTRODUCTION

The primary cause of illness and death in individuals receiving non-cardiac surgery is perioperative cardiovascular problems [(1)]. Globally, non-cardiac surgical procedures are linked to an average overall complication rate ranging from 7% to 11% and a fatality rate ranging from 0.8% to 1.5%, depending upon the use of safety measures. Cardiac problems account for up to 42% of these cases [(2)].

Patient-related risk factors, such as diabetes, hypertension, smoking, ischemic heart disorders, heart failure, and elderly patients undergoing general surgery, have a significant role in the occurrence of cardiac problems after non-cardiac surgery [(3)]. The second component pertains to surgical considerations, including the kind, length, invasiveness, urgency, blood loss, alterations in body core temperature, and fluid shifts associated with the treatment [(4)]. However, urgency, blood loss, and substantial cardio-pulmonary illness provide higher hazards compared to patient-related risk factors [(5)].

Patients who have non-cardiac surgery may face risks both during the surgical procedure and in the subsequent recovery phase. This specific risk is applicable to people who have a documented heart condition; however, it may also be applicable to those who do not exhibit symptoms but possess the potential to develop atherosclerotic cardiovascular disease [(6)].

The stress response is triggered by tissue damage and regulated by neuro-endocrine substances that cause an imbalance between the sympathetic and vagal nervous systems. An elevation in myocardial oxygen demand is induced by this stress. Surgery may disrupt the equilibrium between fibrinolytic and prothrombotic agents, which may lead to an elevated risk of cardiac thrombogenesis. The magnitude and length of the intervention directly correlate with the amount of these changes. A mismatch in the supply-demand ratio of blood flow may occur as a result of metabolic demand caused by a stenosis in the coronary artery. This stenosis can become flow-limiting due to fluctuations in hemodynamics during surgery and the occurrence of acute coronary syndromes (ACS). These syndromes are characterized by the rupture of a vulnerable atherosclerotic plaque induced by stress, along with vascular inflammation, altered vasomotion, and compromised hemostasis [(7)].

This study will be designed to uncover hidden cardiac problems that may cause complications during and after surgery.

PATIENTS AND METHODS

Study area and subjects

This observational cross-sectional study was conducted at Nasr City Health Insurance Hospital and Cardiovascular Medicine Department, Faculty of Medicine, Menofia University Hospitals from May 2023 until January 2024.

Study population included all asymptomatic patients who came to the outpatient clinic for

Received: 12/11/2023
Accepted: 10/01/2024

preoperative assessments. The inclusion criteria encompassed individuals who had undergone non-cardiac surgery with low to intermediate risk, were between the ages of 30 and 60, were of both genders, had a body mass index (BMI) ranging from 20 to 40 kg/m2, and had a history of risk factors associated with cardiac diseases such as hypertension, diabetes, smoking, dyslipidemia, a positive family history of cardiac disorders, or other co-morbidities such as asthma, end stage renal disease, or hyperthyroidism.

Patients having a history of prior cardiac surgery or those with notable cardiac conditions, such as coronary artery disease or structural heart illnesses (e.g., valvular heart disease, congenital heart disease, and heart failure), were excluded from the study.

All cases were subjected to full history taking including risk factors as age, sex, body mass index, smoking and drugs, medical history (congestive heart failure, hypertension, diabetes mellitus, stroke, transient ischemic attack (TIA), thromboembolism history, vascular disease as prior MI, peripheral artery disease, or aortic plaque) and renal disease and surgical history (previous cardiac operations or PCI) and family history (cardiac disease).

Clinical examination was performed for assessment of symptoms and signs of significant cardiac diseases to be excluded.

Cardiac auscultation for additional sounds and murmurs

The individual assumed an upright position throughout the process of auscultation of the back, thereafter assuming a forward leaning posture to facilitate the detection of aortic and pulmonic diastolic murmurs or pericardial friction rub. The description of murmurs included the thoracic cage location at which they are auscultated, as well as their pitch, volume, and the phase of the cardiac cycle in which they manifest. Accurate diagnosis of the murmur might be achieved by auscultating other areas, such as the axilla and carotid arteries.

Signs of heart diseases included symptoms such as dyspnea during physical exertion or in a supine position, fatigue and weakness, edema in the lower extremities, rapid or irregular heart rhythm, impaired physical activity, persistent cough or wheezing accompanied by white or pink blood-tinged mucus, abdominal swelling, rapid weight gain due to fluid accumulation, nausea and loss of appetite, impaired concentration or decreased alertness, and chest pain in cases of heart failure resulting from a myocardial infarction. Laboratory investigations included renal function tests, hemoglobin, hematocrit level, white blood cells, platelet levels and fasting blood sugar.

12-lead surface ECG

In order to identify any irregularities pertaining to the rate, rhythm, axis, voltage, PR and QT intervals, ST Segment deviation, T wave abnormalities, and the existence of bundle branch block, an examination was conducted. Each patient had a twelve-lead electrocardiogram (ECG) to evaluate their rhythm, PR interval, QRS duration, previous RBBB, LBBB, LAHB, and LPHB. Following the surgical surgery, an additional 12-lead electrocardiogram (ECG) was performed in order to identify any conduction anomalies.

Transthoracic Echocardiography

Every patient underwent standard transthoracic echocardiography to assess the size and systolic function of the left ventricle (LV). LV EF was calculated using the m-mode and Simpson method when necessary. LV diastolic function was evaluated using inflow mitral flow, while right ventricle size and systolic function were assessed using TAPSE. Wall motion abnormalities at rest were evaluated, and all valve morphology and flow were assessed using color flow Doppler. Pulmonary artery systolic pressure (PASP) was estimated using TR and the pericardium was evaluated for thickness and effusion. All patients were followed up during the in hospital stay for perioperative complications.

Ethical approval

The research received ethical clearance from the Ethical Committee of Menofia University. Prior to commencing the study and ensuring compliance with local regulations, the protocol and all associated documentation were submitted to the council of the Cardiovascular Medicine Department at Menoufia University for ethical and research permission. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans. The study protocol was approved by the local ethics committee at each of the participating centers. Each patient provided a written informed consent for analysis of anonymized data.

Sample size

A total of 300 patients were enrolled. Convenience sampling involves using respondents who were “convenient” to the researcher. There was no pattern whatsoever in acquiring these respondents—they might be recruited merely asking people who are present in everywhere.

Statistical Analysis

The data that were collected were subjected to analysis using the Statistical Package for the Social Sciences, namely version 23.0 (SPSS Inc., Chicago, Illinois, USA). When the distribution of the quantitative data was parametric (normal), they were reported as the mean± standard deviation and ranges. Conversely, for non-normally distributed variables (non-parametric data), the median ?????and interquartile range (IQR) were used. Furthermore, the qualitative factors were provided in the form of numerical values and percentages. The normality of the data was assessed using the Kolmogorov-Smirnov and Shapiro-Wilk tests.

RESULTS

Age ranged from 30 to 60 years. As regards sex distribution, there was female predominance with 160 females with percentage 53.3%; while range of weight "kg" was 60 to 140 kg. As for the BMI; it ranged 22 to 40 kg/m^{2}. 169 patients (56.3%) were obese, as shown in table I.

Table I: Demographic data distribution among study group

	Demographic data	Total (n=300)
Age Group	30-40 years	67 (22.3%)
	>40-50 years	71 (23.7%)
	>50-60 years	68 (22.7%)
	>60 years	94 (31.3%)
	Mean±SD	52.27±12.67
Sex	Female	160 (53.3%)
	Male	140 (46.7%)
Weight kg	Mean±SD	89.87±17.49
BMI kg/m^2	Mean±SD	30.59±4.91
Obesity	Normal weight	43 (14.3%)
	Overweight	SS (29.3%)
	Obese	169 (56.3%)

(BMI : Body Mass Index)

SBP ranged from 110 to 160 mmHg, DBP ranged from 70 to 100 mmHg, and HR ranged from 65 to 110 bpm (Tables II).

Table II: Clinical examination distribution among study group

	Clinical examination	Total (n=300)
SBP (mmHg)	Mean±SD	130.34±12.19
DBP (mmHg)	Mean±SD	84.63±9.43
HR (bpm)	Mean±SD	84.57±11.59

(SBP: Systolic blood pressure, DBP: Diastolic blood pressure, HR: Heart rate).

This table (III) shows that the most common risk factors were hypertension and diabetes.

Table III: Risk factors distribution among study group

	Risk factors	No.	%
Hypertension	No	165	55.0%
	Yes	135	45.0%
Diabetes	No	165	55.0%
	Yes	135	45.0%
Smoking	No	210	70.0%
	Yes	90	30.0%
Dyslipidemia	No	255	85.0%
	Yes	45	15.0%
Positive family history	No	211	70.3%
	Yes	89	29.7%
Other comorbidities	Asthma	12	4.0%
	ESRD	6	2.0%
	Hyperthyroidism	6	2.0%
	PAD	12	4.0%
	No	264	88.0%

(ESRD: End stage renal disease, PAD: Peripheral arterial disease).

As for the rhythm, most of the patients were NSR and had normal axis. Range of PR interval was 100 to 160 ms and range of QRS was 60 to 130 ms. As for the ST segment, there were 4 patients with ST depression. 13 patients had biphasic T-wave and 14 patients had T-wave inversion. Range of QT interval was 370 to 420 ms. 3 patients had LBBB and 12 patients had RBBB, as shown in table IV.

Table IV: Electrocardiogram distribution among study group

	Electro-cardiogram	Total (n=300)
Rhythm	AF	13(4.3%)
	NSR	281 (93.7%)
	SR	6 (2.0%)
Axis	Normal	285 (95.0%)
	Right axis	15(5.0%)
PR interval ms	Mean±SD	131.75±17.69
QRS ms	Mean±SD	91.54=17.61
ST segment	Normal	296 (98.7%)
	ST depression	4 (1.3%)
T wave	Biphasic	13(4.3%)
	Flat	2 (0.7%)
	Inversion	14 (4.7%)
	Normal	271 (90.3%)
QT interval ms	Mean±SD	395.86=14.39
BBB	LBBB	3(1.0%)
	RBBB	12 (4.0%)
	No	285 (95.0%)

(AF= Atrial fibrillation, NSR= Normal sinus rhythm, SR= Sinus rhythm, BBB= Bundle branch block, LBBB= Left bundle branch block, RBBB= Right bundle branch block)

This table (V) shows that the range of LVESD was 22-49 mm, the range of LVEDD was 28-60 mm, and the range of EF% was 30-72. RSWMA was noticed in 40 patients. Regarding diastolic function. 101 patients were DDG I and 31 patients were DDG II. As for the RV size, all patients (100.0%) were Normal. The TAPSE range was 18-29 mm. Additionally, regarding aortic valve, 18 patients had mild AR, 3 patients had moderate AR, and 279 patients were normal in 2D echocardiography.

Table V: 2D echocardiography distribution among study group

	2D Echocardiography	Total (n=300)
LVESD mm	Mean±SD	33.20i6.70
LVEDD mm	Mean±SD	46.34±6.53
	EF%	
	Mean±SD	57.37±7.85
RSWMA	No	260 (86.7%)
	Yes	40 (13.3%)
Diastolic function	DDGI	101 (33.7%)
	DDGE	31 (10.3%)
	No	168 (56.0%)
RV size	Normal	300 (100.0%)
	Abnormal	0 (0.0%)
TAPSE mm	Mean±SD	23.33±3.60
Aortic valve	Mild AR	18(6.0%)
	Moderate AR	3(1.0%)
	Normal	279 (93.0%)

(LVESD= left ventricular end systolic diameter, LVEDD= left ventricular end diastolic diameter, EF= ejection fraction,

RSWMA= resting segmental wall motion abnormality, DDG I= diastolic dysfunction grade I, DDG II= diastolic dysfunction grade II, RV= right ventricle, TAPSE= tricuspid annular plane systolic excursion, AR= aortic regurgitation)

In 2D echocardiography, this table (VI) shows that regarding the mitral valve, 53 patients had trivial MR and 220 patients were normal. Regarding the tricuspid valve, 83 patients had trivial TR and 137 patients were normal. As for the pulmonary valve, all the patients (100%) were normal. Range of PASP was 15 to 45 mmHg. As for pericardium, 8 patients had mild effusion and 292 patients were normal.

Table VI: 2D echocardiography distribution among study group

	2D Echocardiography	Total (n=300)
Mitral valve	Mild MR	21 (7.0%)
	Mild MS	1 (0.3%)
	Moderate MR	1 (0.3%)
	Moderate MS	4 (1.3%)
	Trivial MR	53 (17.7%)
	Normal	220(73.3%)
Tricuspid valve	Mild TR	50 (16.7%)
	Moderate TR	30 (10.0%)
	Trivial TR	83 (27.7%)
	Normal	137 (45.7%)
Pulmonary valve	Normal	300(100%)
PASP mmHg	Mean±SD	29.92±8.92
Pericardium	Mild effusion	8 (2.7%)
	Normal	292 (97.3%)

(MR= mitral regurgitation, MS= mitral stenosis, TR= tricuspid regurgitation, PASP= pulmonary artery systolic pressure)

This table (VII) shows that regarding CBC, the range of WBCs was 4-9 (10^3/ul), the range of HB was 9-15.5 g, and the range of PLT was 157-455 (10^3/ul). Regarding KFTs, the range of urea was 20-90 mg/dl, while the range of creatinine was 0.7-8 mg/dl. As for LFTs, the range of AST was 12-43 U/L, the range of ALT was 11-36 U/L, and the range of INR was 0.8-1.3.

Table VII: Laboratory data distribution among study group

	Laboratory data	Total (n=300)
	CBC	
WBCs (10^3/ul)	Mean±SD	6.46±1.61
HB (g/dl)	Mean±SD	12.09±1.95
PLT (10^3/ul)	Mean±SD	305.l6±56.49
	KFTs	
Urea (mg/dl)	Mean±SD	39.53±2.35
Creatinine (mg/dl)	Mean±SD	1.57±0.14
	LFTs	
AST(U/L)	Mean±SD	27.53±4.00
ALT (U/L)	Mean±SD	23.52±3.27
INR	Mean±SD	0.98±0.13

(WBCs= white blood cells, HB= hemoglobin, PLT= platelets, KFTs= kidney function tests, LFTs= liver function tests, AST= aspartate aminotranferase, ALT=alanine transaminase, INR= international normalized rate)

The majority of surgery was cataract with 33 patients, followed by 23 patients were laparoscopic cholecystectomy, then 21 patients were dilation and curettage and biopsy as shown in Table VIII.

Table VIII: Surgery distribution among study group

Surgery	No.	%
Cataract	33	11.0%
Laparoscopic cholecystectomy	23	7.7%
Dilation and curretta.se and biopsy	21	7.0%
Meniscectomy	15	5.0%
Carpel tunnel	12	4.0%
Hysterectomy	12	4.0%
Neck femur fracture	12	4.0%
Perianal fistula	12	4.0%
Prostatic surgery	12	4.0%
Varicose veins stripping	12	4.0%
Appendectomy	9	3.0%
Cholecystectomy	9	3.0%
Femoral angioplasty	9	3.0%
Fracture	9	3.0%
Charcot foot repair	7	2.3%
Discectomy and decompression	7	2.3%
Lumbar canal stenosis decompression	7	2.3%
Scapholunate ligament reconstruction	7	2.3%
A-V fistula	6	2.0%
GIT endoscope	6	2.0%
Hernia	6	2.0%
posterior spinal fusion	6	2.0%
Spine fixation	6	2.0%
Thyroidectomy	6	2.0%
Urethrectomy	6	2.0%
A-V shunt	3	1.0%
Breast removal	3	1.0%
Fibroidectomy	3	1.0%
Gastric sleeve	3	1.0%
Hip replacement	3	1.0%
Lipoma	3	1.0%
Mastectomy	3	1.0%
Perianal Abscess	3	1.0%
Pilonidal sinus	3	1.0%
Varicocele	3	1.0%

142 patients were intermediate risk and 158 patients were low risk, as shown in table IX.

Table IX: Surgery risk distribution among study group

Surgery Risk	No.	%
Intermediate	142	47.3%
Low	158	52.7%
Total	300	100.0%

275 patients had no complications. Most common complications were sinus tachycardia, hypotension, and SVT as shown in table X.

Table X: Incidence of complications and types of cardiac complications distribution among study group

Complications	No.	%
Yes	25	8.3%
No	275	91.7%
Types of cardiac complications		
Sinus tachycardia	5	1.7%
Hypotension	4	1.3%
SVT	4	1.3%
Arrested	3	1.0%
Venous thrombosis	3	1.0%
AF	2	0.7%
Pulmonary embolism	2	0.7%
Acute pulmonary edema	1	0.3%
Suspected pulmonary embolism	1	0.3%

(SVT=Supraventricular tachycardia, AF= Atrial fibrillation)

DISCUSSION

Preoperative cardiovascular issues may significantly contribute to illness and death in persons who are having non-cardiac surgery. Out of every 33 hospitalizations, about one patient is susceptible to non-cardiac surgery-related significant cardiovascular and cerebrovascular complications, including death, myocardial infarction, or stroke [(8)].

Consequently, this study was conducted and aimed to uncover hidden cardiac problems among asymptomatic patients that may cause complications during and after low to intermediate risk non-cardiac surgery.

According to **Smilowitz *et al.***, the presence of asymptomatic cardiac risk remains a notable worry among patients undergoing non-cardiac surgery. Perioperative consultants often prioritize this matter as their primary concern [(9)].

The study conducted by **Cao *et al.*** presents a unique opportunity to examine the potential risks associated with surgical interventions in persons with asymptomatic cardiac disease. Numerous studies have shown evidence indicating a positive correlation between certain surgical interventions, including vascular, thoracic, abdominal, and major head and neck procedures, and an elevated susceptibility to cardiac complications subsequent to the intervention [(10)].

The probability of cardiac complications after non-cardiac surgery is determined by the kind of procedure and patient-specific risk factors. Hence, it is important to assess the individual cardiac risk of each patient in relation to the surgical interventions prior to doing a preoperative cardiac assessment, which may include echocardiography [(11)].

Therefore, it is hypothesized that many factors associated with surgical interventions, including the kind of operation, degree of urgency, duration of the procedure, and the likelihood of blood loss and fluid alterations, should be included in the assessment of cardiac risk. The present analysis revealed that the kind of surgery was a major predictor. Specifically, hip replacement and neck femur surgeries were the most often found procedures associated with postoperative cardiac complications. Nevertheless, no complications were seen in the preceding surgical procedures, such as the GIT endoscope, cataract, or hernia. The kind of operation may identify patients with a greater likelihood of having pre-existing cardiac conditions, as well as increased rates of illness and death during the perioperative period. The presence of coronary or myocardial stressors, such as alterations in blood pressure, heart rate, vascular volume, discomfort, or bleeding, during the operation may contribute to the occurrence of perioperative cardiac events. The intensity of these stressors directly impacts the probability of such events. However, it is important to note that endoscopic procedures, superficial procedures, cataract surgery, breast surgery, and normal ambulatory operations are linked with a minimal cardiac risk of less than 1% [(12)].

Nevertheless, the preoperative cardiac examination conducted in this investigation revealed previously unreported cardiac anomalies that pose a danger to individuals undergoing the intended therapy, necessitating further care or intervention. **Choi *et al.*** examined a cohort of 2054 patients who had significant non-cardiac elective surgery. The average age of the patients varied between 61 and 73 years, with a higher proportion of men [(13)].

Higuchi *et al.* conducted a study with a sample of 799 patients who had non-cardiac surgery. The average heart rate was determined to be 71 ± 12 beats per minute, while the average systolic blood pressure (SBP) and diastolic blood pressure (DBP) were found to be 128 ± 17 mmHg and 77 ± 35 mmHg, respectively [(14)].

Previous studies have shown the occurrence of preoperative medical complications in patients undergoing non-cardiac operations. The **Sunny *et al.*** study examined the occurrence of perioperative (PMI) and associated factors in patients undergoing non-cardiac surgery at a tertiary care hospital, with diabetes mellitus affecting 29% of the total patients included in the study. They reported that among the patients, 11.8% had a documented medical history of ischemic heart disease (IHD), 40% were diagnosed with hypertension, 3.8% had experienced a cerebrovascular accident, and 24.8% had a history of smoking [(15)].

Observational studies conducted in similar contexts have shown atypical electrocardiogram (ECG) findings in asymptomatic patients, with reported percentages varying from 4.6% to 44.9% [(16)].

Research conducted by **Teruel *et al.*** revealed that out of the 761 patients who had low-risk outpatient surgical procedures, only 9.4% (72/761) of the electrocardiograms (ECGs) collected during the preoperative examination were originally deemed "potentially significant," indicating the need for further investigation [(17)].

Schein and colleagues concluded that getting a baseline ECG is very beneficial when postoperative electrocardiogram (ECG) measurements are abnormal. However, obtaining a preoperative electrocardiogram (ECG) for low-risk surgical procedures in asymptomatic persons without any pre-existing cardiovascular conditions is seldom advantageous [(18)].

Although there have been associations between certain electrocardiogram (ECG) abnormalities and ischemic occurrences in surgical procedures, it is important to note that these abnormalities do not provide any extra prognostic value when compared to established cardiovascular risk factors [(19)].

Out of the 1271 patients who were scheduled for elective surgery, a much smaller proportion of ECG abnormalities (9.26%) were detected **[(20)]**. In addition, **Turnbull and Buck** identified irregularities in 16% of the electrocardiograms (ECGs) of patients who were in excellent condition and did not have any issues after surgery [(21)].

Cho *et al.* (2014) reported that a total of 692 patients who had elective non-cardiac surgery with low- or intermediate risk exhibited a left ventricular ejection fraction (LVEF) of 54.5 ± 4.9%. Among the patients in this study, 54% of them, with the majority being over the age of 50, had diastolic dysfunction grade 1. Diastolic dysfunction grade 2 and grade 3 were seen in 5.2% and 0.8% of the participants, respectively. 10.8% of the subjects had dilated LVESD, whereas 10.8% showed dilated LVEDD [(22)].

One research has shown a connection between decreased left ventricular systolic performance and perioperative complications, especially in patients with postoperative heart failure [(23)].

According to the findings of **Jasudavisius *et al.***, the most often identified abnormalities in preoperative echocardiography scans of patients who did not need cardiac surgery were poor ejection fraction (25.4%) and aortic valve disease (24.4%). The incidence of RV failure was 6.6%, whereas the prevalence of mitral valve illness was 20.0% [(24)].

Lee *et al.* conducted a study on 4315 persons who had major non-cardiac elective surgery at a tertiary care teaching hospital from 1989 to 1994. They observed that a total of 92 patients (2.1%) had notable cardiac complications, including myocardial infarction (MI) and cardiac mortality [(25)].

Between 1991 and 2000, a university hospital in the Netherlands performed surgery on a total of 108,593 consecutive patients. According to **Boersma *et al.*** (2005), a total of 1877 patients (1.7%) experienced mortality during the surgical process, whereas 543 patients (0.5%) were attributed to cardiovascular causes [(26)].

Lai *et al.* conducted research including case-matched control patients who had non-cardiac procedures. The study found that 5.4% of these patients experienced postoperative cardiovascular morbidities, 37.1% had temporary intraoperative hypotension, and 10.8% had bradycardia**[(27)]**. The results align with the present investigation.

However, it is important to note that endoscopic procedures, superficial procedures, cataract surgery, breast surgery, and normal ambulatory operations are linked with a minimal cardiac risk of less than 1% [(28)].

In our investigation on 300 asymptomatic patients, cardiac problems were seen in 25 instances (8.3%) due to preoperative cardiac abnormalities, which had an influence on surgical results. A total of 16 patients, accounting for 64% of the sample, had concealed heart problems.

Lerman *et al.* found that the crude risk of 30-day postoperative complications was 5.7% among patients with heart failure and 2.7% among patients without heart failure who had elective, ambulatory surgery**[(29)]**.

The existence of postoperative cardiac problems was subjectively documented instead of being graded or assessed.

CONCLUSION

There was a statistically significant increase in postoperative complications among cardiac patients who did not exhibit any symptoms. In relation to the occurrence of complications and the distribution of cardiac complications across the study groups, it was observed that the majority of patients did not experience any complications. However, a small proportion of patients (8.3%) did encounter complications, including sinus tachycardia, hypotension, supra-ventricular tachycardia, cardiac arrest, venous thrombosis, atrial fibrillation, pulmonary embolism, acute pulmonary edema, and suspected pulmonary embolism.

Acknowledgments
Authors would like to thank Menofia University.

Funding: No funding sources
Conflict of interest: None declared.

REFERENCES

1. **Poldermans D, Hoeks S, Feringa H (2008):** Preoperative risk assessment and risk reduction before surgery. Journal of the American College of Cardiology, 51(20): 1913-1924.
2. **Devereaux P, Chan M, Alonso-Coello P *et al.* (2012):** Association between postoperative troponin levels and 30-day mortality among patients undergoing noncardiac surgery. JAMA., 307: 2295–2304.
3. **Wirthlin D, Cambria R (1998):** Surgery-specific considerations in the cardiac patient undergoing noncardiac surgery. Prog Cardiovasc Dis ., 40: 453–468.
4. **Mangano D (2004):** Peri-operative medicine: NHLBI working group deliberations and recommendations. J Cardiothorac Vasc Anesth ., 18: 1–6.
5. **Carroll K, Majeed A, Firth C *et al. (2003)*:** Prevalence and management of coronary heart disease in primary care: population-based cross-sectional study using a disease register. J Public Health Med ., 25: 29–35.

6. **Eagle K, Berger P, Calkins H *et al. (2006)*:** ACC/AHA guideline update for perioperative cardiovascular evaluation for no cardiac surgery –executive summary: a report of the American College of Cardiology/ American Heart Association TASK Force on Practice Guidelines (Committee to update the 1996 Guidelines on Perioperative Cardiovascular Evaluation for Non Cardiac Surgery). JAM COLL Cardio ., 47(11): 2356.
7. **Kristensen S, Knuuti J, Saraste A (2014):** ESC/ESA Guidelines on non-cardiac surgery: cardiovascular assessment and management, European Heart Journal , 35: 2383–2431.
8. **Mansour H, Darwish A, Rayan M (2023):** Asymptomatic cardiac abnormality in patients undergoing low to intermediate risk elective noncardiac surgery, Is it a relevant clinical dilemma? The Egyptian Journal of Hospital Medicine,90(1):3523-8.
9. **Smilowitz N, Gupta N, Ramakrishna H *et al. (2017)*:** Perioperative major adverse cardiovascular and cerebrovascular events associated with non cardiac surgery. JAMA Cardio ., 2(2): 181–7.
10. **Cao D, Chandiramani R, Capodanno D *et al. (2021)*:** Non-cardiac surgery in patients with coronary artery disease: risk evaluation and periprocedural management. Nature Reviews Cardiology,18(1):37-57.
11. **Fleisher L, Fleischmann K, Auerbach A *et al.* (2014):** ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardio.,64(22): e77–137.
12. **Wang C, Qu G, Xu H (2014):** The short-and long-term outcomes of laparoscopic versus open surgery for colorectal cancer: a meta-analysis. Int J Colorectal Dis. , 29(3): 309–20.
13. **Choi J, Cho D, Song Y *et al. (2010)*:** Preoperative NT proBNP and CRP predict perioperative major cardiovascular events in non-cardiac surgery. Heart, 96(1): 56–62.
14. **Higuchi S, Kabeya Y, Matsushita K *et al. (2019)*:** Incidence and complications of perioperative atrial fibrillation after non-cardiac surgery for malignancy. P LoS One, 14(5): e0216239.
15. **Sunny J, Kumar D, Kotekar N *et al. (2018)*:** Incidence and predictors of perioperative myocardial infarction inpatients undergoing non-cardiac surgery in a tertiary care hospital. Indian Heart J. , 70(3): 335–40.
16. **Noordzij P, Boersma E, Bax J *et al. (2006)*:** Prognostic value of routine preoperative electrocardiography inpatients undergoing noncardiac surgery. Am J Cardio.,97(7): 1103–6.
17. **Teruel J, Arruda I, Wilson C *et al. (2020)*:** Evaluation of the age-based pre-anesthesia screening ECG: An analysis of efficacy and predictive potential in outpatient surgery. Peri oper Care Oper Room Manag., 20: 100112.
18. **Schein O, Katz J, Bass E *et al. (2000)*:** The value of routine preoperative medical testing before cataract surgery. N Engl J Med. , 342(3): 168–75.
19. **Richardson K, Shen S Gupta D *et al.(2018)*:** Prognostic significance and clinical utility of intraventricular conduction delays on the preoperative electrocardiogram. Am J Cardio., 121(8): 997–1003.
20. **Kannaujia A, Gupta A, Verma S *et al (2020).*:** Importance of routine laboratory investigations before elective surgery. Discoveries, 2020; 8(3).
21. **Turnbull J, Buck C (1987):** The value of preoperative screening investigations in otherwise healthy individuals. *Archives of internal medicine*,*147*(6): 1101-1105.
22. **Cho D, Park S, Kim M, Kim S *et al. (2014)*:** Presence of preoperative diastolic dysfunction predicts postoperative pulmonary edema and cardiovascular complications in patients undergoing non cardiac surgery. Echocardiography, 31(1): 42–9.
23. **Rafiq A, Sklyar E and Bella J (2017):** Cardiac evaluation and monitoring of patients undergoing non cardiac surgery. Heal Serv Insights, 10: 1178632916686074.
24. **Jasudavisius A, Arellano R, Martin J *et al. (2016)*:** A systematic review of transthoracic and transesophageal echocardiography in non-cardiac surgery: implications for point-of-care ultrasound education in the operating room. Can J Anesth Cand'anesthésie, 63(4): 480–7.
25. **Lee T, Marcantonio E, Mangione C *et al. (1999)*:** Derivation and prospective validation of a simple index for prediction of cardiac risk of major noncardiac surgery. Circulation, 100(10):1043–9.
26. **Boersma E. Kei tai M, Schouren O *et al. (2005)*:** Perioperative cardiovascular mortality in noncardiac surgery: validation of the Lee cardiac risk index. Am J Med. , 118(10): 1134-41.
27. **Lai H, Lai H, Lee W *et al. (2010)*:** Impact of chronic advanced aortic regurgitation on the perioperative outcome of noncardiac surgery. Acta Anaesthesiol Scand.,54(5): 580–8.
28. **Lerman B, Popat R, Assimes A *et al.* (2019):** Association between heart failure and postoperative mortality among patients undergoing ambulatory noncardiac surgery. JAMA surgery, 154(10), 907–914.