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*Preoperative ECG in patients over 40 years of age*

■ *Original Article*

# Routine preoperative electrocardiogram in patients over 40 years of age: a hearty need or a customary practice?

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## Abstract

**Background:** Preoperative 12-lead electrocardiogram (ECG) can provide important information on the state of the patient's myocardium and coronary circulation. Routine screening ECG preoperatively in all adult patients seems cumbersome and unnecessary. **Objectives:** To find out the incidence of ECG abnormality of patients above 40 years of age presenting in the preanaesthetic check up (PAC) clinic and to observe any associated co-morbid conditions. **Methods:** This is a prospective observational study done in the PAC clinic of the department of Anaesthesiology and Critical Care, at B. P. Koirala Institute of Health Sciences, Dharan from June2010 to August 2010 over a period 3 months. The study enrolled 360 patients aged 40 years and above. Laboratory investigations such as hemoglobin, blood grouping, urine routine and microscopic examinations along with biochemical parameters like blood urea, serum creatinine, fasting and post prandial blood sugar were reviewed. A 12-lead ECG was obtained for all patients included in the study. **Results:** Out of 360 patients, 168 were male and 192 female. Abnormal ECG was observed in 38 (10.5%) patients. Frequency of abnormal ECG increased with increasing age. Diabetic, hypertensive and smokers had higher incidence of abnormal ECG. **Conclusion:** A preoperative screening ECG for all adult patients aged 40years visiting PAC clinic is relevant and desirable for risk- stratification.

**Keywords:** abnormal ECG, preoperative evaluation, preanaesthetic check up, smoking habit, hypertension

## Introduction

The commission for the accreditation of health care organizations requires that all patients receive a preoperative anaesthetic evaluation to reduce patient risk and morbidity of surgery as well as to promote efficiency and reduce costs and cancellation rates.[1] Preoperative consultations may initiate additional risk modification tactics, such as reducing tachycardia, controlling hypertension, perioperative cessation of smoking, reducing inflammation in blood vessels and in this way improve perioperative outcome.[2-4] Based on the history, physical, airway and systemic examinations the appropriate laboratory tests are decided and preoperative consultations sought. Preoperative laboratory tests should actually be ordered only based on defined indications such as positive findings on history and physical exam.[5] Preoperative 12-lead electrocardiogram (ECG) can provide important information on the state of the patient's myocardium and coronary circulation. At the outset, screening ECG preoperatively in all adult patients may be cumbersome and probably unnecessary. Furthermore, the recommendations for preoperative testing including ECG have mostly been based on the experiences of affluent developed world with different population characteristics from developing countries like ours. We therefore, undertook this study ascertain the relevance of screening ECG by finding out the incidence of abnormal ECG in patients presenting to our PAC clinic.

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## Methods

This prospective observational study was carried out in the PAC clinic, department of Anaesthesiology and Critical Care, B. P. Koirala Institute of Health Sciences. Patients of either gender aged 40 years and above presenting to the PAC clinic for the first time were included in the study. Eligible patients were selected from the PAC clinic serially from June 2010 to August 2010 (period of 3 months). Consent for participation in the study was obtained from each patient. The referring surgical departments included departments of General Surgery, Orthopedics, Gynecology and Obstetrics, Otorhinolaryngology (ENT) and Ophthalmology. The age, gender, weight and proposed surgery of each patient were documented. After thorough history taking, physical examination; noninvasive blood pressure was taken 3 times at 5 min interval in supine position using manual mercury sphygmomanometer. Patients with noninvasive systolic blood pressure e"140mmHg and diastolic e"90mmHg in all the three readings were categorized as hypertensive according JNC VII.[6] Patients with history of smoking of at least 100 cigarettes in lifetime and currently smoking everyday or some days were considered to be smokers.[7] Laboratory investigations such as hemoglobin, blood grouping, urine routine and microscopic examinations, biochemical parameters like blood urea, serum creatinine, fasting and post prandial blood sugar were noted. Patients were considered to be diabetic when their fasting and post prandial blood sugar levels were above 126 and 200 mg/dl[8] respectively. A 12-lead ECG was obtained for all patients above 40 years of age and findings were observed and noted as normal or abnormal. The type of ECG abnormality was also noted.

The data was entered into MS EXCEL spreadsheet and analyzed using SPSS version 11.5 and Epi info 2000. Relevant cross-tabulations were done. Chi-square test and odd ratio were used to examine the statistical significance of differences. Alpha error was set at 5%.

Out of 360 patients 168 were male and 192 female. Maximum patients 120 (33.3%) belonged to the age group 60-69 years and minimum 66 (18.3%) to the age group e" 70 years. (Table 1)

Majority of the patients were referred to PAC clinic from the Department of General Surgery followed by Gynaecology and Obstetrics, Orthopaedics, ENT and Ophthalmology respectively. (Table 2)

ECG abnormalities were observed in 38 (10.5%) patients. The most common ECG abnormalities encountered were sinus tachycardia and LVH pattern followed by RBBB and other (Table 3). Some patients had more than one ECG abnormalities.

The incidence of abnormal ECG increased with the increasing age group. (Table 4)

The incidence of abnormal ECG was significantly more in male gender than in females. (Table 5)

Hypertensive patients had significantly higher incidence of abnormal ECG than normotensive. (Table 6)

Altogether 39 (11%) patients were smokers. Incidence of abnormal ECG was significantly higher in smokers as compared to non smokers. (Table 7)

Twenty four patients (6.6%) were diabetic of whom 7 (29%) had abnormal ECG. This incidence is significantly higher than that in the non-diabetic patients. (Table 8)

**Table 1: Age and gender distribution**

| Age Group (in years) | Male | Female | Total (%) |
|---|---|---|---|
| 40-49 | 34 | 50 | 84 (23.3%) |
| 50-59 | 42 | 48 | 90 (25%) |
| 60-69 | 62 | 58 | 120 (33.3%) |
| =70 | 30 | 36 | 66 (18.3%) |

*Out of 360 patients 168 were male and 192 female. Maximum patients 120 (33.3%) belonged to the age group 60-69 years and minimum 66 (18.3%) to the age group eˆ 70 years. (Table 1)*

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## Table 2: Referring surgical departments

*Majority of the patients were referred to PAC clinic from the Department of General Surgery followed by Gynaecology and Obstetrics, Orthopaedics, ENT and Ophthalmology respectively. (Table 2)*

## Table 3: Types of ECG abnormalities (n=38)

| Types of ECG abnormalities | Number (%) |
|---|---|
| Sinus Tachycardia | 13 (31.7%) |
| Sinus Bradycardia | 1 (2.4%) |
| Right Bundle Branch Block (RBBB) | |
| Left Ventricular Hypertrophy (LVH) | |
| First degree AV block | 3 (7.3%) |
| Ventricular Premature Contraction (VPC) | 1 (2.4%) |
| ST segment depression | 2 (4.8%) |
| Atrial Fibrillation (AF) | 1 (2.4%) |

*ECG abnormalities were observed in 38 (10.5%) patients. The most common ECG abnormalities encountered were sinus tachycardia and LVH pattern followed by RBBB and other (Table 3). Some patients had more than one ECG abnormalities.*

## Table 4: Age group and ECG pattern

*The incidence of abnormal ECG increased with the increasing age group. (Table 4)*

## Table 5: Gender and ECG pattern

*The incidence of abnormal ECG was significantly more in male gender than in females. (Table 5)*

## Table 6: Blood pressure and ECG pattern

*Hypertensive patients had significantly higher incidence of abnormal ECG than normotensive. (Table 6)*

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**Table 7: Smoking habit and ECG pattern**

*Altogether 39 (11%) patients were smokers. Incidence of abnormal ECG was significantly higher in smokers as compared to non smokers. (Table 7)*

**Table 8: Diabetes and ECG pattern**

*Twenty four patients (6.6%) were diabetic of whom 7 (29%) had abnormal ECG. This incidence is significantly higher than that in the non-diabetic patients. (Table 8)*

**Discussion**

Though ECG monitoring has been included in the minimum mandatory monitoring guidelines, the advantages of routine preoperative ECG screening of all patients coming for surgery has been debated for over a long period of time.[4] There is no absolute consensus as to who should have a preoperative ECG and who should not. This study was carried out to establish how justifiable it is to get an ECG routinely in adults with the age of 40 years and above. Several abnormalities may be detected on a 12- lead preoperative ECG which may significantly alter peri-operative course. ECG abnormalities such as arrhythmias of different types LVH and ST segment alterations certainly affect adversely OT scheduling. ECG abnormalities observed in the present study are similar to those described in the literatures.[9]

The present study has shown that more than one tenth of patients aged 40 years or above presenting for surgical treatment in a community based hospital set up has abnormalities in their ECGs. Expectedly the incidence of abnormal ECG increased with increasing age. Almost two-third of all abnormal ECGs were encountered in population aged 60 years and above in the present study.

Ostrander et al have also reported exponential increase in the incidence of the ECG abnormalities with increasing age with 24% in the age group 40-49 years and 40% in the age group 50-59 years.[10] However, their incidence is much higher in comparison to ours and most likely reflects different general characteristics of their study population. Inference drawn from the data pooled from 16 studies has shown incidences of abnormalities in preoperative ECG of 10% at 40 yrs of age and 25% by the age of 60 years in patients without apparent heart diseases.[11] Our finding is less but relatively close to this finding. Unexpectedly abnormal ECG have been found in 5-6% of patients when records of 2406 ASA I and II patients with preoperative ECG were retrospectively analyzed.[11] This incidence is apparently less than ours and could be due to differences in the study designs as well as the general characteristics of the study population. Lower incidence of ECG abnormalities in female gender in the present study probably reflects hormonal protection.[7] Expectedly our study has shown higher incidences of ECG abnormalities in hypertensive and diabetic patients as well as in the smokers.

The incidence of abnormal ECG in the present study was almost four fold higher in hypertensive patients than in normotensives. This finding obviously is not unexpected as hypertension is known to produce persistent effects on functioning of the heart. In addition, drugs used in the treatment of hypertension can also produce different types of ECG changes.[10]

Diabetic patients also showed more than 3 fold higher incidence of abnormal ECG in the present study as compared to non-diabetic patients. Two of the diabetic patients had ST segment depression suggestive of ischemia. Myocardial ischemia frequently occurs without pain in diabetic patients.[12]

Even though resting ECG is considered to lack adequate specificity and sensitivity, it is extremely useful screening tool in detecting potentially life-threatening ECG changes in diabetic patients. ST segment depression and QTc prolongation have been

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found to predict all- cause mortality in type II diabetic patients.[13]

Patients with history of smoking in our study similarly had higher incidence of abnormal ECG than non-smokers. Smoking is known to stimulate sympathetic system and release of catecholamine from adrenal medulla.[7] Moreover, prolonged smoking is associated with ischemic and consequent ECG changes. Significantly higher heart rates and incidences of arrhythmia have been reported in smokers compared to non-smokers by Majtaba.[14]

The present study suffers some limitations including relatively small sample size for the type and design of the study, use of limited variables and ignoring conditions likely to produce ECG abnormalities other than hypertension, diabetes and smoking. Despite these limitations, finding of the present study of relatively high incidence of abnormalities in preoperative ECG in a background of lack of optimal back up facilities and sophistication in our set up sufficiently support the relevance of current practice of preoperative ECG testing.

## Conclusion

The incidence of abnormal ECG significantly increases with the age in smokers and in diabetic & hypertensive patients. Therefore, a preoperative screening ECG for all adult patients aged 40 years visiting PAC clinic is desirable for risk-stratification.

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