Original Research Article

Prevalence of ECG Abnormalities during Routine Preoperative Evaluation-A Retrospective Single Institute Study

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ABSTRACT

Introduction: Preoperative ECG assessment irrespective of age and its co-relation with different co-morbid conditions was the aim of this study.

Materials and Methods: All patients above one year of age attending PAC clinic were included and patients put for any type of cardiac surgery were excluded from the study. Prevalence of preoperative abnormal ECG evaluated at different age groups above one year of age and its co-relation to co-morbid conditions like hypertension, COPD, Diabetes Mellitus, Thyroid Disorder etc were also evaluated. Atrial fibrillation, left or right bundle branch block, left ventricular hypertrophy, premature ventricular complexes, pacemaker rhythm, or Q-wave or ST-segment changes were classified as abnormal ECG.

Results and Observation: Total no of patients during the study period were 1032. Among them 101 presented with abnormal ECG. Among 101patients with abnormal ECG, 60 were presented with co-morbid conditions. Average ECG abnormality was 9.79% irrespective ages. Among children's also there were significant numbers abnormal ECGs but all of them were symptomatic patients.

Conclusion: There is an increase incidence of abnormal ECG even in asymptomatic cases with increasing age. Preoperative ECG is advisable in younger age groups including children and adolescent with symptomatic heart diseases and or with co existing diseases

Key Words: preoperative, abnormal ECG, significant, all age groups, with symptom, co- morbidity.

INTRODUCTION

The 12-lead ECG is the primary clinical tool for non-invasive assessment of cardiac electrical function. [1] An abnormal ECG can identify risk for cardiac morbidity but a normal ECG does not always confirm a healthy heart. [2] Though, ECG monitoring has been included in the minimum mandatory monitoring guidelines, the advantages of routine preoperative screening of all the patients coming for surgery, has been questioned. [3] The present study aimed to assess the preoperative ECG abnormalities irrespective of age and its co-relation with co-morbid conditions.

MATERIALS AND METHODS

After approval by the institutional ethical committee, this study was conducted under the Department of Anaesthesiology and Critical Care, GMCH. This observational study was conducted from September to October 2016.

All patients above one year of age attending PAC clinic were included. Cardiac surgery patients were excluded from the study. The data were collected from PAC

forms which were filled up for all patients undergoing anaesthesia as per our departmental protocol. Hypertensive patients with blood pressure above 140/90 mmHg, COPD patients with or without history of smoking, Bronchial Asthma ,Diabetes Mellitus, Thyroid Disorders etc were considered as co-morbid conditions. [4,5] A 12-lead ECG was obtained for all patients above 1 years of age and findings were observed and noted as normal or abnormal. Electrocardiographic (ECG) results showing atrial fibrillation, left or right bundle branch block, left ventricular hypertrophy, premature ventricular complexes, pacemaker rhythm, or Q-wave or ST-segment changes were classified as abnormal. [6]

Statistical Methods

Single proportion test is used to test the significance of a single proportion. Here, the Hypothesis tested for each of the age group is: H01: The proportion of patients having abnormal ECG in the age group in the population, P=½=0.5, which means that the proportion of patients having abnormal ECG in that age group in the population is

not significant. Against H11: The proportion of patients having abnormal ECG in the age group in the population, P≠0.5, which means that the proportion of patients having abnormal ECG in that age group in the population is significant.

The test statistic used for this purpose is

$$Z = \frac{p-p}{\sqrt{\frac{pq}{n}}} \sim N(0,1)$$

N (0, 1) When n is large (>30)
N (0, 1) stands for the standard normal distribution. Here, p is the sample proportion of patients in the age group having abnormal ECG and n is the total number of patients in the age group.

RESULTS AND OBSERVATION

Total no of patients during the study period were 1032. Among them 101 presented with abnormal ECG. Among 101patients with abnormal ECG, 60 were presented with co-morbid conditions. Average ECG abnormality was 9.79% over all age groups.

Table1: Number of patients with abnormal ECG in different age groups with sample proportion (p).

Age group(years)	Total patients	No of patients with abnormal ECG	Percentage of abnormal ECG	Sample proportion (p)
1-10	35	2	5.71	0.054
11-20	77	5	6.49	0.064
21-30	223	17	7.62	0.076
31-40	243	18	7.41	0.074
41-50	240	26	10.83	0.108
51-60	133	17	12.78	0.128
>60	81	16	19.75	0.196

In table 1, it has been observed that for each of the age group, the p- value of the test is coming out to be < 0.05. So, we reject H_{01} at 5% level of significance and conclude that for each of the age group, the proportion of patients having abnormal ECG in that age group in the population is significant.

Table 2: Number of male patients with abnormal ECG in different age groups with sample proportion (p).

Age group(years)	Total patients (Male)	No of patients with abnormal ECG	Sample proportion (p)
1-10	18	2	0.111
11-20	28	2	0.071
21-30	65	9	0.138
31-40	80	10	0.125
41-50	87	12	0.140
51-60	60	8	0.133
>60	53	11	0.208

In table 2, it has been observed that for each of the age group, the p- value of the test is coming out to be < 0.05. So, we reject H_{02} at 5% level of significance and conclude that for each of the age group, the proportion of male patients having abnormal ECG in that age group in the population is significant.

Table 3: Number of female patients with abnormal ECG in different age groups with sample proportion(p).

Age group(years)	Total patients (Female)	No of patients with abnormal ECG	Sample proportion (p)
1-10	17	0	0
11-20	49	3	0.061
21-30	158	8	0.051
31-40	163	8	0.049
41-50	153	14	0.092
51-60	73	9	0.123
>60	28	5	0.178

In table 3, it has been observed that for each of the age group, the p- value of the test is coming out to be < 0.05. So, we reject H_{03} at 5% level of significance and conclude that for each of the age group, the proportion of female patients having abnormal ECG in that age group in the population is significant.

Table 4: Number of patients with ECG abnormalities

Types of ECG abnormalities	Number of patients
LVH	22
ST segment changes	17
Pathological T inversion	9
RBBB	9
LBBB	8
APC	8
VPC	7
AVblock	7
rSr pattern	5
Atrial Fibrillation	5
Atrial Flutter	4

In table 4, it has been observed that 101 patients presented with ECG abnormalities. Most common ECG abnormality was left ventricular hypertrophy followed by ST segment changes.

Table 5: Number of patients with co-morbid conditions.

Diseases	No of patients
Hypertension	30
Hypothyroidism	10
Diabetes	8
COAD	3
Asthma	2
CLD	3
CKD	2
Hyperthyroidism	2

In table 5. It has been observed that 60 patients out of 101 abnormal ECG cases (i.e. 59.40%) presented with co-morbid conditions. The most common co-morbid condition was Hypertension followed by Hypothyroidism.

DISCUSSION

A classic and virtually mandatory component of perioperative evaluation is the 12 lead ECG. [7] This study was carried out to establish how justifiable it is to get an ECG routinely in all preoperative cases irrespective age. Several abnormalities may be detected on a 12-lead preoperative ECG which may significantly alter perioperative course. ECG abnormalities observed in the present study found to be statistically significant in all age groups as contrary to other studies. [8] The present study has shown that 9.79% of patients coming for PAC had abnormalities in their ECGs which are comparable to Jacob et al with average abnormal ECG of 10.05%. [9] Total no of patients were 1032 among them 101 presented with abnormal ECG. The incidence of abnormal ECG was almost steady up to 40 years of age(6.61%) which has increased exponentially after 40 years with increasing age which was 10.83 % at 41 to 50years ,12.78% at 51 to 60 years of age and it increased to 19.75% after 60 years. [table 1]. In our study average ECG abnormality above 40 years of age was 14.45% which was close to Ghimire et al finding of 10.05%. [10] Perez A, et al shown incidences of abnormalities in preoperative ECG of 10% at 40 years of age and 25% by the age of 60 years in patients without apparent heart diseases. [11] Our finding is relatively close to this finding. Few studies shown higher percentage because of study population, category of patients, geographical variation etc. [12]

In our study overall ECG abnormalities in female was 7.33% compared to male counterpart of 13.81% which reflects hormonal protection. [13,14] Our study has shown higher incidences of ECG abnormalities in patients with co-existing diseases (hypertension, diabetic, COPD, hypothyroidism etc). [15] In the present study out of 101 abnormal ECG cases 60 patients (59.40%) presented with co-morbid conditions. [table5].

In the present study all seven cases with abnormal ECG in the age group of 1-20 years had symptomatic heart diseases and all abnormal ECG cases in the age group of 21- 40 years, were either had symptomatic heart diseases or co-morbid conditions.

The present study suffers some limitations including relatively small sample size, retrograde in nature, single centre based. We have also not studied the affect of abnormal ECG during perioperative periods. Despite these limitations, the present study showing high incidence of preoperative abnormal ECG even in younger age group support the relevance of current practice of preoperative ECG irrespective of age.

CONCLUSION

Preoperative ECG should be done in all cases over 40 years of age as there is an increase incidence of abnormal ECG even in asymptomatic cases with increasing age. Preoperative ECG is advisable in younger age groups including children and adolescent with symptomatic heart diseases and or with co-existing diseases.

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