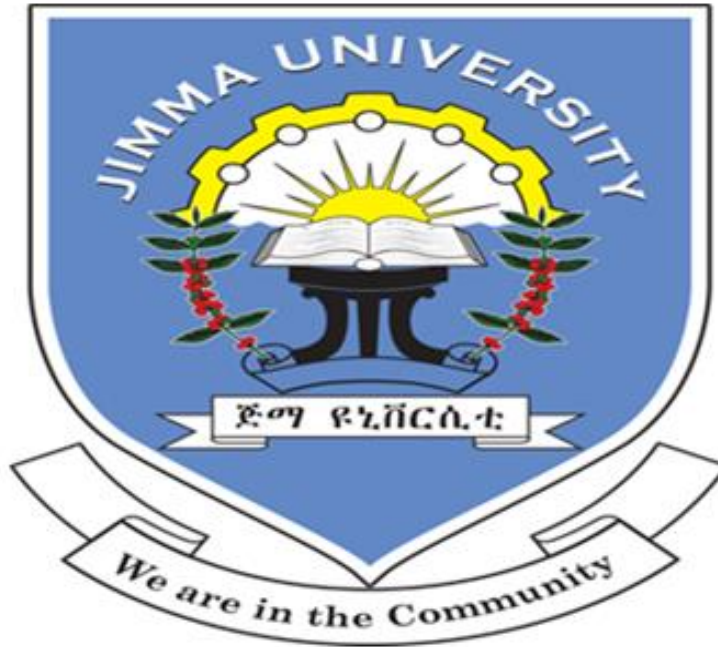Electrocardiographic Findings in Stroke Patients and Its Association to Discharge Outcome among Patients Visiting To JUMC, Jimma, Ethiopia

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THESIS TO BE SUBMITTED TO THE DEPARTMENT OF INTERNAL MEDICINE, INSTITUTE OF HEALTH, FACULTY OF MEDICINE, JIMMA UNIVERSITY, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE CERTIFICATE OF SPECIALITY IN INTERNAL MEDICINE .

JIMMA, ETHIOPIA.

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ELECTROCARDIOGRAPHIC FINDINGS IN STROKE PATIENTS AND ITS ASSOCIATION TO DISCHARGE OUTCOME AMONG PATIENTS VISTING TO JUMC, JIMMA, ETHIOPIA

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SUMMARY

Background:.Electrocardiographic abnormalities are commonly seen in patients with cerebrovascular accident. Physicians are having difficulties on interpretation of electrocardiogram findings in patients with acute stroke as it can mimic that of myocardial

infarction. Understanding these changes taking place in patients with acute stroke which are not due to myocardial infarction/ischemia is very important.

Objective: To assess the electrocardiographic abnormalities and its association with discharge outcome among patients with stroke at JUMC, Jimma, Ethiopia

Patients and methods: Hospital based prospective cross-sectional study was conducted for all patients with stroke who visited JUMC from November –January (for 3 months). Information on sociodemographic factors, risk factors for strokes, time between onset of stroke to emergency departments, electrocardiographic, CT scan and laboratory data was collected from patients chart and face to face interviewed using structured q--- prepared for this purpose. Electrocardiogram was done for all participants. Data was checked for completeness, cleaned and enter to epidata version 4.6 and analyzed using SPSS statistical software version 26. Descriptive statistics, bivariate and multivariate logistic regression analysis was performed and p-value less than 0.05 and 95% confidence interval was used to declare statistical significance.

Result: A total of 100 stroke patients were included in the study, from them 51% were hemorrhagic stroke and 49% were ischemic stroke. Among these 65 (65 %) were males and 35(35%) females. Most of the patient's age were above 40 years (82%) and known hypertensive patients (51%).From study participant 69% were having abnormal electrocardiogram finding and T wave inversion were the most common (29%) followed by atrial fibrillation (12%) and left axis deviation (12% .Aspiration pneumonia (p=0.01), high admission blood pressure (P=0.03) and abnormal electrocardiogram finding specifically sinus bradycardia P value of (P=0.011) was associated with poor discharge outcome.

Conclusion and recommendations: High frequency of abnormal electrocardiogram finding in patients with stroke was observed in this study.The abnormal electrocardiogram finding was associated with poor discharge outcome which will need early detection and possible intervention of underlying cause.

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List of Abbreviations

AF-----Atrial fibrillation

BP-------blood pressure

CI-------confidence interval

CNS-----Central nervous system

CT------computed tomography

ECG-----Electrocardiography

GCS----Glasgow comma scale

JUMC---Jimma University center

LVH----Left ventricle hypertrophy

LVO----large vessel occlusion

PR-------pulse rate

RR--------respiratory rate

WHO----word health organization

Chapter 1: Introduction

1.1 Background information

CNS infarction or ischemic stroke is defined as brain, spinal cord, or retinal cell death attributable to ischemia, based on pathological, imaging, or other objective evidence of cerebral, spinal cord, or retinal focal ischemic injury in a defined vascular distribution; or clinical evidence of cerebral, spinal cord, or retinal focal ischemic injury based on symptoms persisting ≥24 hours or until death, and other etiologies excluded(1).

Hemorrhagic stroke is due to bleeding into the brain by the rupture of a blood vessel. Hemorrhagic stroke can be classified as intracerebral hemorrhage (ICH) and subarachnoid hemorrhage (SAH). ICH is bleeding into the brain parenchyma, and SAH is bleeding into the subarachnoid space(2).

Cardiac arrest, decreased tissue perfusion, and different cardiac arrhythmia are the cardiovascular events that can be seen in stroke patients even in the absence of previous cardiac disease. Sudden death due to cardiac arrest can associated with cerebral and coronary arteriosclerotic diseases as they sharing common risk factors. Follow up of stroke patients with ECG has to be increased to reduce the excess risk of mortality(3).

Despite the mechanisms of electrocardiographic abnormalities are not clearly known and Sympatico-adrenal axis activation due to insular damage is the proposed mechanism, finding of stroke patient with such type of abnormality is common(4).

Excessive release of catecholamine's in to the patients' blood, direct neuronal activation of heart by central nervous system and coexisting underlying cardiac diseases can lead to repolarization abnormality and dysrhythmia in patients with stroke. Apart from coexisting ischemic heart diseases, the hormonal and neuronal effect on cardiac systolic or diastolic function is not clearly known.(5).

1.2. Statement of the problem

Cerebrovascular accidents are the second leading causes of mortality in the world and associated with annual morality rate of around 5.5 million. In addition to the high mortality rate stroke accounts high burden of morbidity which results long-term disability in around 50% of patients with stroke who recovered from acute attack of CVA. As a result stroke has major negative impact on economic, social and health activities(6).

Beginning from 20 years back the new case finding rate of stroke has been increasing in Africa despite there is declining rate in developed countries. The new cases of stroke can be increasing for the future in Africa unless sustainable and population based efforts to reduce its incidence has been taken as a team(7).

Stroke also one of the major health problems in Ethiopia as like other developing countries. Among stroke patients in Ethiopia, ischemic stroke accounts 31.5%, hemorrhagic stroke accounts 18.3% and majority of patients (50.2%) were having undetermined types of stroke(8).

In Ethiopia the morality rate of stroke patients in the hospital are raising and patients with factors like low GCS, high NIHS, hemorrhagic stroke, pneumonia and dysphagia are sated as poor prognostic factors and associated with high mortality(9).

ST changes on ECG have been found to be the one of the prominent ECG finding in patients with stroke which were detected in 11% of the patient's with stroke. Among ST elevation accounts 63.63% and the rest were having ST depression and ST depression has been detected in patients with ischemic stroke(10).

Electrocardiographic finding in patients with cerebrovascular accidents with previous history of cardiac disease are also common from which T-wave inversion accounts (28%) and ST segment depression are found to be the second commonest finding in ischemic stroke. On the other way round QTc prolongation (10%), LVH (16%) and T wave inversion were common ECG abnormalities in hemorrhagic stroke than doe's ischemic stroke. Patients With abnormal Electrocardiographic finding has been found to having high mortality than patients with normal ECG(11).

The site of cerebrovascular accidents are identified to be one of the association finding for ECG changes with this insular lesion has been studied as the causes of various types of ECG changes. From the identified findings, sinus tachycardia, ectopic beats, and ST elevation are the commonest. Right insular lesion with electrocardiographic abnormality has been associated with an increased risk of death in patients with stroke (12).

Among the ECG findings in patients with cerebrovascular accidents, atrial fibrillation has been one of the risk for the increased rate of 30 day mortality, high risk of CVA recurrence and poor quality of life(13).

QTc prolongation among cerebrovascular accident patients are associated with increased risk of death within the first days of admission(14).

The 12-lead standard ECG is a low-cost screening test for assessing abnormal ECG markers in patients with stroke and it's feasible for my study. Unfortunately it is quite common in our setting that patients are not followed with ECG as part of the routine care. We do have large numbers of patients with stroke who are visiting Jimma University medical Centre. We have also noticed that there are many patients with stroke who has electrocardiographic abnormalities which are noticed during our day to activity despite we don't have the actual data for such types of patients.

The gravity of ECG abnormalities as well as its association to discharge outcome in stroke patients has remained unstudied. Hence, studying the gravity of abnormal ECG and its discharge outcome in stroke patients will be of paramount importance.

1.3 SIGNIFICANCE OF THE STUDY

Assessing ECG abnormalities and its association to discharge outcome in patients with stroke will provide knowledge regarding the gravity of electrocardiographic changes among stroke patients. It may also change the practice of physicians and other health care workers with regard to regular use of ECG monitoring in stroke patients to identify early fatal arrhythmia. This will improve service and quality of care for patients admitted to stroke unit at Jimma university medical Centre.

There is no previous study done at JUMC in this topic. Therefore the study will be used as a baseline for future studies on this topic. It can also be used as reference tool for development of applicable guidelines.

No study has been done on ECG changes in stroke patients with its association to discharge outcome in Ethiopia. Therefore it will be very good entry for large scale studies at the country level.

Chapter 2: Literature Review

Cross-sectional study design done among 52 patients diagnosed with CVA at Hadassah university hospital in Jerusalem implies that abnormalities in conduction, rhythm and ST-T wave change has been identified. Patient with stroke and ECG abnormality especially the new changes are found to be having poor prognosis for survival(15).

A cross-sectional study conducted in 1977 at Maimonides medical Centre and university of New York among 100 patients with diagnosis of CVA and the identified ECG abnormalities were ST segment depression, prolonged Q-Tc interval and atrial fibrillation with higher incidence than T wave inversion, conduction defect, premature beat and LVH. Among identified ECG abnormalities conduction defect and atrial fibrillation has been associated with higher morality in patients with stroke and ECG abnormality(16).

A cross-sectional study held in 1979 at the university of Washington hospital among 150 patients with CVA and the result signifies that 92% of patients with stroke have been identified as having abnormal ECG finding. QT prolongation and ST-T wave changes has been associated high admission systolic blood pressure without association to mortality(17).

Hospital based cross-sectional study was carried in 2013 at Iranian tertiary hospital among 361 patients with cerebrovascular accident, from the identified ECG abnormality ischemic like ECG changes and arrhythmia were the identified prominent finding(18).

Prospective cross-sectional study has been held at the National Center of Neurological Science, Khartoum Sudan in 2021 among 50 patients with acute stroke the finding implies that tachycardia were the prominent electrocardiographic abnormality and the area of stroke were identified as initiating factor for arrhythmia(19).

Case control hospital based study was held in 2012 at Kashan university of medical science in Iran among 262 patients with cerebral infarction showed that abnormal ECG finding were detected in 68.3% of ischemic stroke and T wave inversion and ST-T wave changes were the most common finding(20).

Hospital based cross-sectional was conducted in 2017 in Nigeria and Ghana among 890 patients with acute stroke and the finding was implies that 85.4% of stroke patient were having a minimum of one ECG abnormality. Identified atrial enlargement on ECG was associated with mortality and functional impairment(21).

In cohort study done in 2019 at school of medicine of Guilan University in Iran among 546 stroke patients and the finding was 82.7% of patient with cerebrovascular accident were having a minimum of one ECG abnormality and inverted T waves (21.2%, sinus tachycardia (11.7%), atrial fibrillation (11.5%) and pathologic Q wave (9.9%) were the most prominent finding. Abnormal ECG finding were related to mortality in patients with ischemic stroke apart from other factors (22).

In summary the above different studies which are stated in literature review based their chronologic order, the methodology they use and its relevance to the current topic, were done in different areas and almost all shows that high prevalence of ECG change abnormalities in patients with acute stroke. The most common ECG changes were ST depressions, ST elevation, QT prolongation and other different ECG changes were also reported. Despite several studies has been done on the gravity of ECG change in stroke patients, only 4 studies showing the association between the mortality of stroke patients with ECG change. The identified ECG abnormality which was associated mortality was QT prolongation, atrial enlargement and atrial fibrillation.

2.2 conceptual frameworks
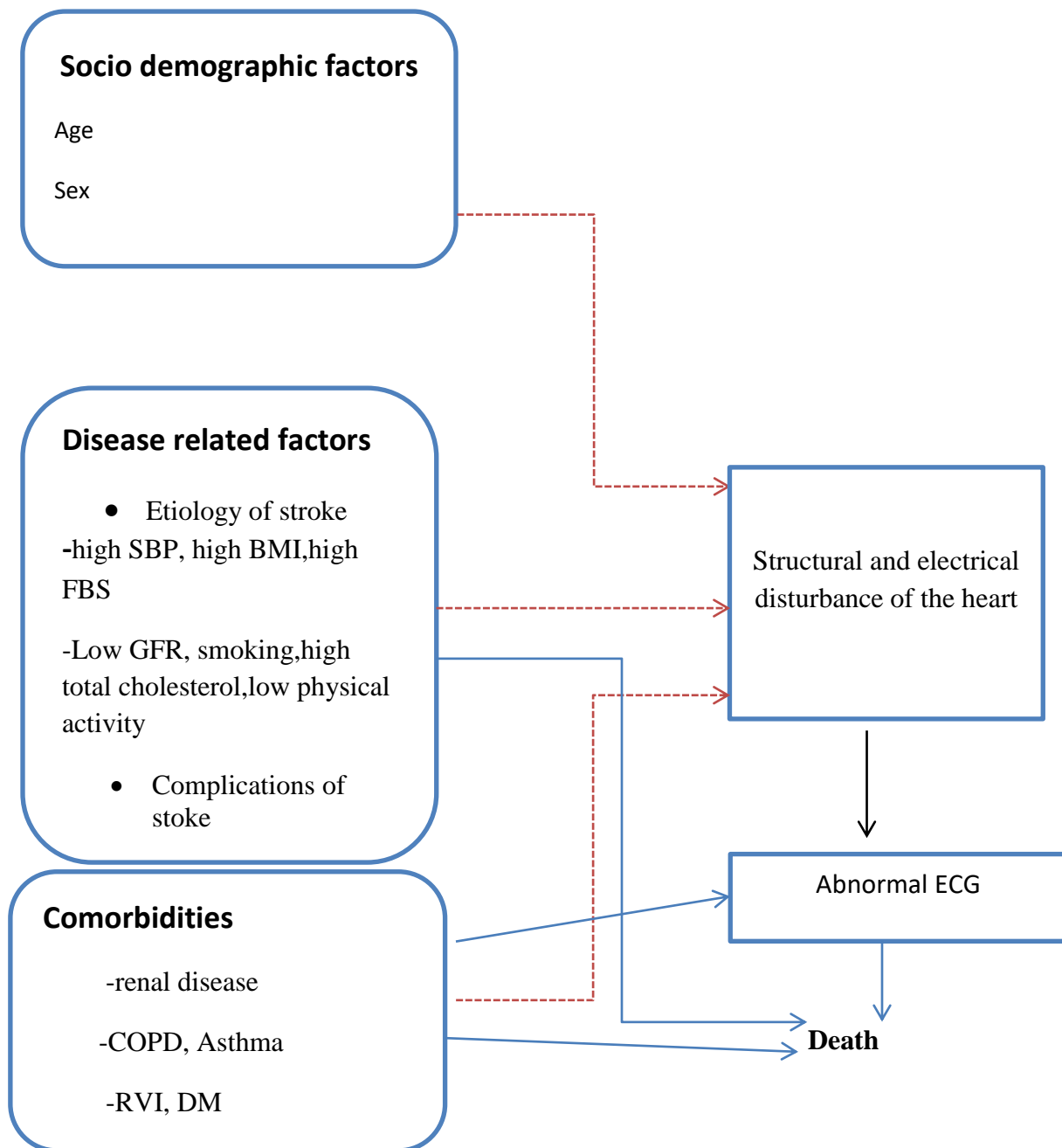
Figure 1: Conceptual framework of ECG abnormality and its association to discharge outcome among patient with stroke, at Jimma University Medical center, Jimma, Ethiopia, 2022.

CHAPTER THREE: OBJECTIVES

3.1 General objective:

❖ To assesses the ECG abnormalities and its association to discharge outcome in patients with stroke at Jimma University medical Centre, Jimma, Ethiopia, 2022 G.C

3.2 Specific objective

❖ To determine the ECG abnormalities in patients with stroke at Jimma University medical Centre, Jimma, Ethiopia, 2022 G.C

❖ To determine the discharge outcome in relation to ECG abnormality in patients with stroke at Jimma University medical Centre, Jimma, Ethiopia, 2022 G.C

❖ To determine the clinical risk factors of stroke among patients who visit JUMC.

CHAPTER FOUR: METHOD AND MATERIALS

4.1 STUDY AREA AND PERIOD

The study was conducted at Jimma University Medical Center .Geographically JUMC is located in Jimma town, 352 km southwest of Addis Ababa. The town has 2 government hospitals, 3 health centers and is also home for different higher educational institutions.

The department of Internal Medicine is one of the departments which provides both inpatient and outpatient services. The inpatient services are organized in to general medical wards and units. In stroke unit there were 100 patients over 3 month.

The data collection was conducted from November –January (3 months) 2022/2023 G.C

4.2 STUDY DESIGN

A hospital based cross-sectional study was conducted.

4.3 Source population

All patients who has confirmed diagnosis of stroke with clinical or imaging evidence and visiting Jimma University medical center in the study period

4.4 Study population

All patients who has confirmed diagnosis of stroke with clinical or imaging evidence and visiting Jimma University medical center and willing to participate in the study period.

4.4.1 Inclusion criteria

Patients who has confirmed diagnosis of stroke and admitted to medical ward, medical emergency or other wards and voluntary to participate in the study

4.4.1 Exclusion criteria

Patients who are unwilling to participate

4.5 Sampling

4.5.1 Sampling size

Since there were limited number of admitted patients with stroke and there were shortage of time as a result all patients who are fulfilling inclusion criteria was conducted without sampling.

4.6 Measurements

Independent Variables

-Age

-Sex

-HTN, DM, dyslipidemia, physical inactivity, smoking

-Renal disease, HIV, COPD, Asthma

-Aspiration pneumonia, Increased ICP

-anterior circulation, posterior circulation, sub cortical, cortical area of lesion

-ECG changes

Dependent variables

-discharge outcome

4.6.2 Data collection procedures

A Checklist were used and filled by reviewing the patients chart and interviewing the patient. The check list were provided initially in English language and translated to native languages (Afaan Oromo) by bilingual translators. The checklist includes the socio-demographic characteristics of the patients, clinical characteristics. An ECG machine which was used for patients at the department of internal medicine at internal medicine ward was used to record ECG of the patient.

Data on the prevalence of ECG abnormalities (ST depression, ST elevation, QT prolongation, AF, T wave inversion) was collected by a physician who recorded 12 lead resting ECG following the standard ECG recording procedure. Data regarding socio-demographic characteristics and associated factors of ECG abnormality in stroke was collected by 1 Bsc nurse by careful review of the patient's chart and asking the client using the prepared checklist and questionnaire. The ECG was done by 1 Bsc nurse. The overall activity was supervised by the principal investigator. Training for data collectors were given in order to have a common understanding of the data collection tools and improve the quality of data.

4.6.3   Procedure of Electrocardiogram

After having informed consent the procedure of ECG were undertaken as follows-

1. Explain the procedure for the patient
2. the patient should be free and relax
3. the patient should told to lay supine
4. expose the chest of the patient for placement of electrodes
5. then place the ECG leads in appropriate place on the patient's body as stated in **A** and **B** below
6. Then record the ECG then take image or print out

A. electrode placements

✓ LL was placed on left lower limb----its color is green

✓ LA was placed on left upper limb ------its color is yellow

✓ RA was placed on right upper limb -----its color is red

✓ RL was placed on right lower limb --------its color is black

B-Chest electrodes should be placed as follow

Lead	Positive electrode placement
V1	4th intercostal space right
V2	4th intercostal space left
V3	Directly between V2 and V4
V4	5th intercostal space at midclavicular line
V5	Left anterior axillary line
V6	Mid axillary line on left

4.7 Data quality control

Before the actual data collection pre-testing of the data collection instrument was checked on 10 participants ahead of data collection at stroke ward of Jimma University Medical Center. After the pretest, the necessary amendment of tool was done for the final data collection.

Data collectors were trained intensively for 1 day on the overall study design, implication of each variable, and objective of the study and data collection procedure. The standard of the procedure during ECG test was checked.

The Primary investigator checked the collected data for completeness and corrective measures was taken accordingly. The collected data were cleaned, coded and explored before analysis.

4.8 Data Processing and analysis

The collected data were checked, coded, and entered in to Epi-Data version 4.6 and were analyzed using software program SPSS 26. Descriptive analysis was carried out using frequency distributions tables.

Presence of statistical association between dependent and independent variables were assessed using multivariate logistic regression. Adjusted Odds Ratio with 95% Confidence interval was used to measure strength of association. Variables with $p \leq 0.05$ were considered as statistically significant. Results presented in text, tabulation and figurative presentations from which conclusions and recommendations were made. In addition, results were compared with other studies and discussed.

4.9 Ethical consideration

Ethical clearance was obtained from ethical Review Committee of Jimma University. The willingness of the respondents and informed verbal consent was obtained from study participants before enrollment into the study. Participants' confidentiality, Equity of services and interests was ensured during the study period. There were no risky procedures that were performed on participants.

4.10 Dissemination plan

After approval from Jimma University, the findings of the study will be disseminated to all relevant stakeholders through presentation and publication. Copies of the research will be given to Jimma University institute of health graduate program and the department of Internal Medicine.

4.11 Operational definition

Stroke - Abrupt onset of neurologic deficit due to a focal vascular cause lasting greater than 24hrs or having neuroimaging evidence of ischemia or hemorrhage

Known cardiac-patients who are diagnosed as cardiac diseases before the event of stroke

Anti-arrhythmic drugs-drugs which is prescribed by health personnel for cardiac related problems

Complication-patients with stroke who develop ICP, brain herniation or hospital acquired infection.

Comorbidities-Long standing disease conditions which includes HIV/AIDS, TB, DM, CKD, CLD, HTN, COPD

Abnormal ECG: abnormal rate, rhythm, axis, conduction or repolarization findings from ECG.

Sinus Rhythm- Every P wave is followed by QRS complexes

Tachycardia- Pulse rate of above 100beat/min.

Bradycardia-Pulse rate of less than 60 beat/min

AV block-PR interval of greater than 200ms

Wide QRS complex-duration of QRS greater than 120ms

QT interval prolongation- Corrected QT intervals greater than 465ms in women and 457ms in men

QT interval shortening- short QT syndromes with corrected QTc less than 320ms

ST elevation - Elevation>0.1 mV in limb leads or >0.2 mV in precordial leads

ST depression- depression of ST segment greater than 0.1 mV

Negative T wave- Not the same polarity as the QRS complex

Normal P wave- less than 80ms

Normal PR interval- 120-200 ms

Normal QRS complex- 80-120 ms

Normal ST segment- ≤ 0.1 mV mV in limb leads and ≤ 0.2 mV precordial leads

Normal QTc interval- 374 - 465 ms (females), 368 - 457 ms (males)

Normal RR interval- 600 - 1000 ms (Heart rates 60 - 100 bpm)

Sinus bradycardia – sinus rhythm with regular P wave and pulse rate on ECG less than 60 bpm

Sinus tachycardia - sinus rhythm with regular p wave pulse rate on ECG more than 100 bpm

Aspiration pneumonia- clinical or radiological evidence of respiratory abnormality with no other explanation in patients with stroke or physician decision

Raised intracranial hypertension- Patient with stroke who are having clinical evidence of projectile vomiting, headache, irregular respiration etc

CHAPTER FIVE: RESULTS

5.1 SOCIODEMOGRAPHIC CHARCTERSTICS

A total of 100 stroke patients were included in the study, from these 65 (65 %) were males, 35(35%) females, most of the patients were above 40 years (82%), 4% were below 20years (2 hemorrhagic stroke&2 ischemic stroke with the lowest age of 17years).Majorities of patients cannot read & write (54%), were farmers (49%) and from rural area (67 %).

Table-1-Sociodemographic characteristics of stroke patients at JUMC, Jimma, Ethiopia 2023

		frequency	%
Age of the patients in years	Lest than 20	4	4.0%
	20-40	14	14.0%
	Above 40	82	82.0%
Sex of the patients	m	65	65.0%
	f	35	35.0%
Marital statuses of patients	single	6	6.0%
	Married	85	85.0%
	Divorced	5	5.0%
	Widowed	4	4.0%
Educational status of patients	Cannot read and write	54	54.0%
	Grade 1-8	22	22.0%
	Grade 9-12	15	15.0%
	University/Coll eges.	9	9.0%
Occupation of the patients	Governmental employee	13	13.0%
	Merchant	12	12.0%
	Farmer	49	49.0%
	Housewife	25	25.0%
	other	1	1.0%
Residence of patients	Urban	33	33.0%
	Rural	67	67.0%

5.2. Clinical risk factors of stroke

In this study most patients were known hypertensive patients (51%), 5% were a known diabetes patients, 4% of patients were having history of cigarette smoking, 6% of patients were having alcohol drinking, 5% of them were having cardiac diseases, 22% of patients were arriving to emergency out patients department within 4.5hours of illness onset and the rest 78% were arriving after 4.5hrs.

Table-2 –Risk factors of stroke patients at JUMC, Jimma, Ethiopia, 2023

		Frequency	%
DM history	Yes	5	5.0%
	No	95	95.0%
HTN history	Yes	51	51.0%
	No	49	49.0%
Smoking	Yes	4	4.0%
	No	96	96.0%
Lung diseases	Yes	1	1.0%
	No	99	99.0%
Alcohol	Yes	6	6.0%
	No	94	94.0%
History of cardiac diseases	Yes	5	5.0%
	No	95	95.0%
Arrival time to hospital	Less than 4.5hrs	22	22.0%
	4.5-24hr	63	63.0%
	After 24hrs	15	15.0%

5.3 Clinical finding of the patients

Majority (76%) of patients GCS were 13-15 and 20% of patients GCS were 7-12 and the rest 4% were less than 7.Most patients were having high admission blood pressure (61%) ,from them 10 % of patients BP were above 185/110mmHg.

In this study 17% of patients were having signs of raised ICP and 13% of patients were having aspiration pneumonia.

Table-3-clinical findings of stroke patients at JUMC, Jimma, Ethiopia 2023

		Frequency	%
GCS	13-15	76	76.0%
	7-12	20	20.0%
	Less than 7	4	4.0%
Admission blood pressure(in mmHg)	Above 185/110	10	10.0%
	160/100-185/110	32	32.0%
	140/90-160/100	19	19.0%
	Less than 140/90	39	39.0%
Respiratory system finding	Normal	92	92.0%
	Transmitted sound	5	5.0%
	Rales	2	2.0%
	Other	1	1.0%
CVS exam finding	Normal	94	94.0%
	Murmur	5	5.0%
	Other	1	1.0%
Sign of ICP	Yes	17	17.0%
	No	83	83.0%
Aspiration pneumonia	Yes	13	13.0%
	No	87	87.0%

5.4 Laboratory and imaging findings of the patients

In this study 51% were hemorrhagic stroke, 49% were ischemic stroke and 16 % of patients were having abnormal renal function (serum creatinine above 1.2mg/dl). Hyponatremia were the most common electrolyte abnormality observed in patients (5%) followed by hypokalemia (4%).

Table-4-laboratory and imaging findings of stroke patients at JUMC, Jimma, Ethiopia 2023

		Frequency	**%**
Stroke type	Ischemic stroke	49	49.0%
	Hemorrhagic stroke	51	51.0%
renal function abnormality	Yes	84	84.0%
	No	16	16.0%
serum electrolyte	Normal	88	88.0%
	Hyperkalemia	1	1.0%
	Hypokalemia	4	4.0%
	Hypernatremia	2	2.0%
	Hyponatremia	5	5.0%
Lipid profile	Not done	20	20.0%
	Normal	73	73.0%
	High TG	1	1.0%
	High LDL	2	2.0%
	Low HDL	3	3.0%
	Other	1	1.0%

5.5- Discharge outcome and duration of hospital stay

Most patients from the study participants were improved at discharge (70%) and 16% were died at discharge and the rest were the same status at discharge. Majority of patients were staying at hospital for 2-7 days and 9% were discharged with in 48hrs.

Table-5- Discharge outcome and duration of hospital stay of stroke patients at JUMC, Jimma, Ethiopia, 2023

		Frequency	%
Duration of hospital stay	Less than 48hrs	9	9.0%
	2-7 days	69	69.0%
	More than 7 days	22	22.0%
Discharge outcome	Improved	70	70.0%
	died	16	16.0%
	Against	2	2.0%
	Same	12	12.0%

5.6 ECG finding

In this study 69% of stroke patients were having abnormal Electrocardiogram finding ,T wave inversion were the most common ECG finding which is observed in (29% of stroke patients $ 10% I with known hypertensive),the next most common ECG finding were atrial fibrillation observed in 12 % of patients and LAD 13%.

Table-6-Electrocardiogram finding of stroke patients at JUMC, Jimma, Ethiopia 2023

		Frequency	%
ECG finding(total)	Normal	31	31.0%
	Abnormal	69	69.0%
	Sinus tachycardia	4	4.0%
	Sinus Bradycardia	4	4%
	AF	12	12.0%
	Atrial flutter	1	1.0%
	PVC	3	3.0%
	AV block	1	1.0%
	LBBB	2	2.0%
	RBBB	2	2.0%
	QT abnormality	0	0 %
	Peaked T wave	8	8.0%
	Flat T wave	8	8.0%
	Inverted T wave	29	29.0%
	ST depression	3	3.0%
	ST elevation	7	7.0%
	Pathologic Q wave	3	3.0%
	LVH	5	5.0%
	RVH	1	1.0%
	Low voltage	3	3.0%
	LAD	13	13.0%
	RAD	8	8.0%
	Counter clockwise rotation	4	4.0%
	Clockwise rotation	1	1.0%
	P wave abnormality	1	1.0%

5.7 Electrocardiogram finding comparison between Ischemic and hemorrhagic stroke

The electrocardiogram abnormalities are almost comparable between ischemic and hemorrhagic stroke.

Table-7 –ECG finding in each stroke subtype of stroke patients at JUMC, Jimma, Ethiopia 2023

	From total (100%)	
	Ischemic stroke %	Hemorrhagic stroke %
Normal	14	17
Abnormal	35	34
Sinus tachycardia	2	2
Sinus bradycardia	0	4
Atrial fibrillation	7	5
Atrial flutter	1	0
PVC	3	0
AV block	0	1
LBBB	1	1
RBBB	2	0
QT abnormality	0	0
Peaked T wave	6	2
Flat T wave	4	4
Inverted T wave	11	18
ST depression	1	2
ST elevation	3	4
Pathologic Q wave	3	0
LVH	4	1
RVH	0	1
Low voltage	1	2
LAD	7	6
RAD	7	1
Counterclockwise R	1	3
Clockwise rotation	0	1
P wave abnormality	1	0

5.8. Bivariate logistic regression analysis of abnormal physical exam, renal function and aspiration pneumonia with its association to discharge outcome

Table-8 -Bivariate logistic regression analysis of abnormal physical exam, renal function and aspiration pneumonia with its association to discharge outcome in stroke patients at JUMC, Jimma, Ethiopia, 2023

		Died	Survived	AOR	95% CI		P. value
GCS	13-15	4	72	.5	.43	1.4	.27
	7-12	10	9	.365	.02	6.39	.251
	Less than 7(coma)	2	2	.58	.56	2.5	.341
Admission BP	Above 185/110	6	4	1.244	.121	1.458	.003
	160/100-185/110	3	29	.355	.036	3.554	.379
	Less than 160/100	8	50	1.378	.068	2.053	.835
Patients with aspiration pneumonia		7	6	1.302	0.002	1.858	.011
Abnormal respiratory finding	Transmitted sound	3	2	1.6	.45	1.8	.190
	Rales	2	0	.256	.234	1.19	1.00
	Wheezing	1	0	1.000	.34	3.9	.998
Signs of ICP	Projectile vomiting	1	0	.893	.450	2.3	.231
	Pupillary dilation	3	2	.540	.453	.90	.567
	Decreased consciousness	1	5	.23	.022	1.000	.459
	Other	0	5	.56	.37	3.60	.567
	Impaired renal function	4	12	.459	.212	1.56	.987

5.9- Bivariate binary logistic regression analysis of Electrocardiogram findings and discharge outcome

Table-9- Bivariate binary logistic regression analysis of ECG changes and discharge outcome in stroke patients at JUMC, Jimma, Ethiopia 2023

	Died %	Survived %	AOR	95% C.I		P-Value
Sinus tachycardia	1	3	.861	.234	2.001	.319
Sinus bradycardia	4	0	1.593	.192	1.722	.019
Atrial fibrillation	3	9	.420	.300	.933	.999
Atrial flutter	0	1	.500	.201	2.001	.999
PVC	0	3	.326	.080	.890	1.000
AV block	0	1	.760	.423	.978	1.000
LBBB	0	2	.510	.280	.789	.999
RBBB	0	2	.689	.0123	.989	.999
Peaked T wave	3	5	.960	.148	1.136	.928
Flat T wave	0	8	.192	.021	1.755	.144
Inverted T wave	6	23	.956	.040	.990	.999
ST depression	1	2	.396	.356	4.241	.258
ST elevation	2	5	.293	.126	.855	.357
Pathologic Q wave	1	2	.102	.001	1.750	.337
LVH	0	5	.700	.300	1.000	.999
RVH	1	0	.784	.149	.897	1.000
Low voltage	0	3	1.230	.120	1.250	.999
LAD	1	12	.150	.005	4.476	.274
RAD	1	7	.220	.002	5.466	.532
Counterclockwise rotation	2	2	.400	.570	2.010	1.000
Clockwise rotation	0	1	.341	.301	.969	.900
P wave abnormality	1	0	.968	.340	1.871	.800

5.10. Multivariate logistic regression analysis of factors associated with poor discharge outcome in stroke patients

 High admission blood pressure above 185/110mmHg, aspiration pneumonia and sinus bradycardia were associated with the poor discharge outcome (hospital mortality) with P value of (0.003,0.011,0.011) respectively

Table-10-Multivariate logistic regression analysis of factors associated with poor discharge outcome(hospital mortality) in stroke patients at JUMC, Jimma, Ethiopia 2023

	AOR	95% C.I.		P.Value
Male sex	3.610	.329	3.787	.228
Cannot read/write	1.420	.755	1.501	.111
Rural residence	4.783	.269	5.155	.287
Time arrival less than 4.5hr	.790	.246	8.724	.158
Time arrival longer than 4.5hr	2.589	1.614	6.169	.121
Admission BP above 185/110	1.254	.121	1.458	.003
Admission BP(185/110-160/100)	.355	.036	3.554	.379
Admission BP(less than 160/100)	1.378	.068	2.053	.835
Sign of ICP	.104	.008	1.360	.084
Aspiration pneumonia	1.302	.002	1.858	.011
Hyperkalemia	.571	.037	3.794	.688
Hypokalemia	.159	.023	1.79	1.000
Hypernatremia	.600	.400	2.778	.116
Hyponatremia	.260	.120	.956	.999
Sinus bradycardia	.712	.1553	.904	.011

5.4 DISCUSSION

In this study a total of 100 stroke patients were included, from these 65 (65 %) were males and 35(35%) females, most of the patients were above 40 years (82%), known hypertensive patients (51%),cannot read and write (54%), farmers (49%) and from rural area(67 %),which is similar to the study done at Kashan university (20).

In this study abnormal electrocardiogram finding was observed in 69% of stroke patients which is similar to study done at Kashan university of medical science in Iran (20). The study done in Nigeria and Ghana among patients with stroke ,the abnormal electrocardiogram finding was observed in 85.4% of stroke patient(21).

The most common abnormal Electrocardiogram finding in this study was inverted T waves which accounts 29%, the 2nd most common ECG finding were atrial fibrillation observed in 12 % of patients and LAD (13%) which is similar to the study done at school of medicine of Guilan University in Iran (22).The study done at Maimonides medical Centre and university of New York the most common electrocardiogram finding was ST depression, prolonged Q-Tc interval and atrial fibrillation than T wave inversion (16),at eastern Nepal,the most common elctrocardiogram finding was ST elevation(10),at National Center of Neurological Science, Khartoum Sudan the most common electrocardiogram finding was sinus tachycardia(54%)(19).The discrepancy will be difference study population, genetic variation and time difference in electrocardiogram record after stoke onset.

In this study sinus bradycardia was the abnormal electrocardiogram finding which was associated with poor discharge outcome in patients with stroke with P value of 0.011.

The study done at Hadassah University Hospital in Jerusalem ST –T changes and conduction abnormalities were associated with increased mortality (15),at Maimonides medical Centre and university of New York conduction defect and atrial fibrillation has been associated with higher morality (16),at the university of Washington hospital showed that there is no association between abnormal electrocardiogram finding and hospital morality or discharge outcome(17),at school of medicine of Guilan University in Iran Abnormal ECG finding were related to mortality in patients with stroke apart from other factors(22).The discrepancy between this study and others will be difference in underlying comorbidities, early identification and treatment of underlying causes of electrocardiogram finding

In this study patients with stroke with aspiration pneumonia was having poor discharge outcome with P value of (0.011) which is similar to study done at tertiary referral center in the east of England (23).Study done at Norfolk and Norwich University Hospital (NNUH),showed no association between discharge outcome and aspiration pneumonia (24).The discrepancy between the first two studies and the last may be the difference in ICU care, early detection rate and treatment.

This study also showed that high admission blood pressure associated with poor discharge outcome with P value of (0.03) which is similar to study done at 36 different countries' (25), at Dinajpur Medical College Hospital(26).

5.5. Limitation of the study

The main limitation of this study is being small sample size and short duration of study. The other important limitation of the study is other potential factors which will affect the result were not determined like echocardiography findings which will have impact on the current findings.

CHAPTER SIX: CONCLUSION AND RECOMMENDATION

6.1: CONCLUSION

This study showed that abnormal electrocardiogram finding was observed in 69% of patients, from this the most common electrocardiogram finding were inverted T waves, atrial fibrillation and left axis deviation.

High admission blood pressure, aspiration pneumonia and abnormal electrocardiogram specifically sinus bradycardia was having statically significance association with hospital mortality with P value of less than 0.05 at 95% of CI.

6.2: RECOMMENDATION

Based on this study it is recommended that early identification of abnormal electrocardiogram finding will be very important in stroke patients to identify the underlying etiology of abnormal electrocardiogram marker and to give treatment for it.

Timely identification and treatment of aspiration pneumonia $ high admission blood pressure in stroke patients will improve patient discharge outcome.

Finally it is recommended that further studies to be done as our sample size was small and will not represent the country level data.

Annex I

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Annex I Consent form

Title- electrocardiographic abnormalities in stroke patients and its association to discharge outcome among patients visiting to JUMC, Jimma, Ethiopia

Principal investigator-ALEFE AKLEWOK (MD)

Organization: Jimma University, College of Health Sciences

Sponsor: Jimma University, College of Public Health and Medical sciences

Purpose of the Research - Assessment of electrocardiographic abnormalities in stroke patients and its association to discharge outcome among patients admitted to JUMC.

Procedure-the study primarily involves interviews using semi-structured questionnaire on stroke and ECG will be done for them.

Benefits, Risk and /or Discomfort-There are no risk or direct benefit that participants will be given in this research project.

Incentives/Payments for Participating- The participants will not be provided any incentives or payment to take part in this project.

Confidentiality-The personal information of the patients and the participants will be kept confidential and stored in a file, without their names by assigning a code number to it.

Right to Refusal or Withdraw-participants will have full right to refuse participating and withdraw at any time in this research.

Language for communication-Afaan-Oromo/English

Person to contact-This research project will be reviewed and approved by the ethical review committee of Jimma University.

If you have any question, you can contact Dr.ALEFE by one of the following way at any time
-Mobile No -0935157240 or Email addresses-alefeaklewok@gmail.com

Information to the study participant

Greeting: - Good morning/afternoon

My name Dr.Alefe Aklewok and I am conducting a scientific research on electrocardiographic abnormalities in stroke patients and its association to discharge outcome at JUMC, Jimma, Ethiopia. I am happy to inform you that as you selected one of study participant in this study. By participating in this study, you may feel some discomfort in wasting your time. However, your participation is definitely important in identifying ECG abnormalities and its association to discharge outcome. The interview may take 15-20 minutes and the ECG procedure will take 20-25 minutes.

I want to tell you that any information obtained from you will remain confidential. There is no risk or direct benefit in participating in this research project. Your participation is determined only by you and it will not affect the services you are getting. It is only if you are willing I will proceed to ask you some information

Finally, you are kindly requested to give us your genuine response in the interview.

Certificate of consent

Do you wish to participate in the study?

If the participant agrees to participate in the study, let him/her to sign consent and proceed with interview.

I have adequate information about the research and I have decided to participate in the study.

Participant signature ---

If the participant says "No, I don't want to participate in the study", thank him/her and proceed to the next participant

Name of interviewer---------------------------------Date-------/-------/-------------------

Annex II - QUESTIONNAIRE

Patient MRN---------------Code----------------- Phone number ------------

Part 1-Sociodemographic information of the patient

1. Age in years ------------------------
2. Sex------ A-male -- ☐   B –Female--☐
3. Marital statuses-----A -Single ☐   B-married ☐ C-Divorced ☐   D-Widowed
4. Educational status –A-cannot read and write ☐   B- Primary education(grade 1-8) ☐
   C-Secondary grade (grade 9-12) ☐ D-University/college ☐
5. Occupation-----A- Governmental employee ☐   C-Student ☐   E-Farmer☐
   B- Merchant ☐   D- Daily laborer☐
   F- House wife☐   G- Others (Specify) --------------
6. Residence -----A-Urban ☐   B—Rural ☐

II –Clinical profile (risk factor)

1. Do you have history diabetes before?   A. yes ☐   B-no ☐

If your answer is yes to Q 1

I. What treatment you get? Circle the answer

A. Diet/exercise   B. Metformin/Glibenclamide   C-insulin

II. Specify the duration of illness------------------------------

2. Have you told by physicians as high blood measurement? A .Yes ☐   B.no ☐

If your answer is yes to Q2

I. What treatment you get? -------------------------------------

II. Specify the duration of illness--

3. Have you smoke cigarettes?   A. yes ☐   B .no ☐

If yes to Q3 how much per day and how long you smoke it? ---------------------- (pack year)

4. Did you have history of lung diseases?

   A-yes ☐   B-no ☐

If your answer is yes to Q 4

What type of lung diseases is it? A.COPD ☐   B- Asthma ☐   C-other ☐

5. Have you drink alcohol? A-yes ☐   B-no ☐   .If your answer is yes to Q 5

I. Specify the type of alcohol-----------------

II. Amount and duration---------------------

6. Do you history of HIV/AIDS   A-yes ☐   B-no ☐   If yes to Q6

I. How long you have been with the diseases?

 II. What treatment you get? ----------------------

7. Did you have history of cardiac diseases? A-yes ☐   B-no ☐

If your answer is yes to Q 8 What treatment you get?

A-diet/exercise   B. Medication (specify) -------------------------

8. Have you doing physical exercise for your health? Circle

 A. Walking   B-swimming   C. farming   D. Running   E. Bicycling F. Sedentary

Specify the total duration of your choice on Q 8 per day and per week----------per day---------per week

III-Questionnaire related the current illness

7. After how many hours or days you arrive to hospital after symptom onset? ---------------------

8. Physical exam

I. GCS. V-M-E----

II. V/S   BP--------RR -------------PR-----------To-----------------SPO2---------RBS----------------

III- A. Respiratory system finding-------- -------------------------------------- (positive finding only)

IV.CVS exam finding--------------- -- (positive finding only)

9. 9.1 does the patient has sign of ICP?

        A. yes ☐   B.no ☐   if yes circle the identifying evidence of increases ICP

        A. decreased level of consciousness   B. pupillary dilation   C. Projectile vomiting

        D. Headache   E-Irregular respiration   F. High blood pressure

    9.2. Does the patient have lower extremity swelling after admission? A yes   B no,   if yes

            Write the lower extremity Doppler finding of the patient-----------------------------------

10. Does the patient have aspiration pneumonia?

        A. yes ☐   B.no ☐

11. What type of stroke does the patient has based on CT scan?

A-ischemic ☐   B-hemorrhagic ☐

12. Site of hemorrhage /infarction based on CT scan

A-frontal lobe ☐   B parietal lobe ☐   C-subcortical area ☐

D. Temporal lobe   E. Occipital   F. Cerebellum   G. brain stem

13. Serum biochemical test laboratory result (write the actual value of each) if done

A-RFT (Cr) ----- ----   C- Serum electrolyte   Na------   K-------- Ca------------

B-Blood glucose/hemoglobin A1C/------   D- lipid profile---------------------------------------
------

14. Duration of hospital stay-------------------------------

15. What was the discharge outcome? A. improved ☐   B. died ☐   C. against ☐ D. same

Thank you!!!!

Part IV -ECG finding

Is the   ECG   I -normal ☐   II-abnormal ☐

If abnormal specify the abnormality

1. Rate   A- Sinus tachycardia

                   B- Sinus bradycardia

2. Rhythm -   2.1 Supraventricular   A .AF   B. MAT   C. atrial flutter   D. other

                2.2. Ventricular   A .PVC   B. Ventricular tachycardia

3. Conduction abnormality   A .1st AV block   D. left bundle branch block

                          B. 2nd AV block   E. right bundle branch block
                          C. 3rd AV block

4. QT duration abnormality

A-QT prolongation ☐   B-QT shortening ☐

5. T wave abnormality   A. peaked on ---------------------------------

                         B. Flattening on ----------------------------

                         C. inverted on -------------------------------

6. ST segment abnormality   A. Depression on ----------------------------

                            B. Elevation on ---------------------------------

7. Q wave abnormality on-----------------------

8. Voltage abnormality   A. LVH ☐   B. RVH ☐   C. Low voltage on -----------

9. Axis abnormality   A.LAD ☐   B.RAD ☐

10. Rotation abnormality   A. counterclockwise ☐   B. clockwise rotation ☐

11. P wave abnormality   A. peaked ☐   B. widened ☐

12. Other abnormalities specify ---------------------------------------

Odeeffannoo hirmaataa qorannichaaf

Nagaa:-Akkambultan/ooltan?

Maqaan koo Dr.Allafaa Aklawaaqii fi nuti qorannoo saayinsawaa dhukkubsatootta dhiigni sammuu keessatti dhangala'e irratti rakkoolee elektirookaardiyoogiraafii fi walqabsiisa (hidhata) isaa irratti bu'aa gadhiifamu giddugala fayyaa yuunivarsiitii Jimmaa(JUMC)tti,Itiyoophiyaa keessatti gaggeessaan jirra. Qorannoo kana keessattis hirmaattotaa qorannoo keessaa tokko taatanii akka filatamtan gammachuudhanan isinitti hima. Qorannoo kanarratti hirmaachuukeef,yeroo kee qisaaseessuu irratti hanga tokko miirri isinitti hintolle dhaga'amuu danda'a. Haatahu malee, hirmaannaan keessan rakkoolee elektirookaardiyoogiraafii (ECG abnormalities) fi walqabsiisa isaa bu'aa gadhiifamu adda baasuu keessatti sirriin barbaachisaadha. Af-gaaffiin kunis daqiiqaa 15-20 fudhachuu kan danda'uu fi adeemsi (hojimaatni) ECG immoo daqiiqaa 20-25 fudhachuu danda'a.

Odeeffannoon isin irraa argamu kamiyyuu iccitiidhan kan eegamu ta'uusaa isinitti himuun barbaada. Pirojektii qorannoo kanaa keessatti hirmachuudhaan balaan gahu ykn bu'aan kallattiin argamu homtuu hinjiru. Hirmaannan keessan isin qofaan kan murtaa'uu fi tajaajila argachaa jirtan irratti dhiibbaa hinqabu. Yoo fedhii qabaattan qofa, odeeffannoo muraasa isin gaafachuuf ittin fufa. Dhumarrattis,gaaffii fi deebii (Af-gaaffii) kana keessatti deebii keessan dhugaa akka naaf laattan kabajanaan isin gaafadha.

Ragaa eeyyamaa

Qorannicha kana keessatti hirmaachuu ni barbaaddaa?

Hirmaataan qoranicha irratti hirmaachuuf yoo walii gale,akka inni/isheen malleetteessu/situ gochuun gara Af-gaaffiitti fufi.

Waa'ee qorannoo kanaa odeeffannoo gahaa ta'e waanan argadheef,qorannicha irratti hirmaachuuf murteessera.

Mallattoo hirmaataa/ttuu…………………………………………..

Hirmaataan, "Lakki, ani qorannicha irratti hirmaachuu hinbarbaadu" yoo jedhe, isa/ishee galateeffadhuutii gara hirmaataa isa itti aanutti ce'i/darbi.

Maqaa gaafataa………………………………………….. Guyyaa………………………………

Teessoo qunnamtii:- alefeaklewok@gmail.com

Bilbila:-0935157240

Dabalata II-GAAFFII

Lakk.galmee
Dhukkubsataa(MRN)……………………….koodii…………Lakk.Bilbilaa……………………
…………

Kutaa-1 Odeeffannoo hawaas-diimoogiraafii dhukkubsataa

1. Umrii(waggaadhan)…………..
2. Saala …………..   A. dhiira   ☐   B. dubartii ☐
3. Haala gaa'ilaa ….   A. Qeerroo/Qarree ☐   B. kan fuudhe/heerumte ☐
   C. Hiikkaa ☐   D. Kan abbaan manaa irraa du'e ☐
4. Sadarkaa barnootaa   A. dubbisuu & barreessuu hindanda'u ☐
                        B. sadarkaa jalqabaa(kut.1-8)   ☐   C. sadarkaa lammaffaa (9-
   12) ☐
                        D.sadarkaa olaanoo (University/colloge) ☐
5. Hojii …   A. Hojjataa mootummaa ☐   B. Daldalaa ☐   C. Barataa ☐ D. Hojjataa
   guyyaa ☐
             E. Qotee bulaa   ☐   F. Haadha manaa   ☐   F. Kan biraa(ibsi)……
6. Bakka jireenyaa   A. Magaalaa ☐   B. Baadiyyaa ☐

II-Piroofayilii kilinkaa(Sababa balaa ta'an)

1. Kanaan dura seenaa dhukkuba sukkaaraa qabduu?   A. Eeyyee ☐   B. Lakki ☐
   Yoo deebiin kee Gaaffii 1ffaa irratti "**Eeyyee**" ta'e…
   I.   Yeroo turtii dhukkubichaa ibsi…
   II.   Wal'aansa/yaala akkamii argatte? Deebii keetti marsi.
   A. Soorata/sochii qaamaa B. Meetfoormiin/Gilibeenkilaamaayid   C. Insulinii
2. Safartuu dhiibbaa dhiigaa olkaa'aa akka qabdu ogeessaan sitti himamee turee?
   A. Eeyyee ☐   B. Lakki ☐
   I.   Yoo deebiin kee G2 "Eeyyee" ta'e, Yeroo turtii dhukkubichaa ibsi…
   II.   Wal'aansa/yaala akkamii argatte? Deebii keetti marsi.
3. Tamboo ykn sigaaraa ni xuuxxaa? A. Eeyyee ☐   B. Lakki ☐
   Yoo deebiin kee G3 "Eeyyee" ta'e, turtii hangamiif xuuxxe?.....(korojoo/waggaa)

4. Seenaa dhukkuba sombaa qabdaa? A. Eeyyee ☐   B. Lakki ☐
   Yoo deebiin kee G4 "Eeyyee" ta'e, dhukkuba sombaa gosa akkamiiti?
   A.COPD   B.Asmii   C. kan biroo

5. Dhugaatii alkoolii ni dhugdaa? A. Eeyyee ☐   B. Lakki ☐
   I. Gosa alkoolii ibsi………

   II. Hangaa fi yeroo…..

6. Seenaa dhukkuba HIV/AIDS qabdaa? A. Eeyyee ☐ B. Lakki ☐
   Yoo deebiin kee G4 "Eeyyee" ta'e,
   I. Dhukkubicha waliin yeroo hammamiif turte?...........
   II. Wal'aansa/yaala maalii argatte?.................
7. Seenaa dhukkuba onnee qabdaa? A. Eeyyee ☐ B. Lakki ☐
   Yoo deebiin kee G4 "Eeyyee" ta'e,wal'aansa/yaala maalii argatte?
   A. Sochii qaamaa B. Qoricha
8. Fayyaa keetiif sochii qaamaa ni gootaa/taasistaa? A. Eeyyee ☐ B. Lakki ☐
   A .miilaan deemuu B. Daakuu C. Qotuu D. Fiiguu E. Biskileeta oofuu
   III _Gaaffiilee dhukkuba amma jiruun walqabatu

7. Mallattoon dhukkubichaa erga sirratti mul'ateetii sa'aatii ykn guyyoota meeqa keessatti gara hospitaalaa deemte?
8. Qorannoo/Qormaata/ Qaamaa
   I.GCS

   II. V/S (safartoowwan bu'uuraa) BP ….RR….SPO2……RBS

   III. A. Argannoo sirna hargansuu (barreessi)

   B. Argannoo qorannoo sirna onnee-ujummoolee dhiigaa (CVS)(bareessi)

9. Dhukkubsataan mallattoo dabaluu dhiibbaa keessoo buqqee mataa/sammuu (ICP)qabaa?
   A. Eeyyee ☐ B. Lakki ☐
   Deebiin kee G9 "Eeyyee" yoota'e, mallattoo sanatti marsi.
   A. Sadarkaa dammaquu hir'achuu B. qaawwi agartuun ijaa babal'achuu C. Balaqqamsuu humnaan bahu D. Dhukkubbii mataa E. Hargansuu sirrii hintaane
10. Dhukkubsataan dhibee sombaa waa liqimsuun dhufe(aspiration) qabaa?
    A. Eeyyee ☐ B. Lakki ☐

11. Qorannoo Siitskaanii(CT scan) irratti hundaa'uun, gosti dhibee dhiigni sammuu keessatti dhangala'uu dhukkubsataan qabu maali?
    A. Dhiigni hanqachuun ☐ B.Dhiiguu dhiigaa (dhiigni dhangala'uun) ☐

12. Bakka/iddoo dhiigni itti dhangala'uu/cobe...
    A. Marsaa dhiigaa duree ☐ B. Marsaa dhiigaa duubee ☐ C. Koorticaala jala(subcortical) ☐

13. Bu'aa/firii qorannoo laabraatoorii baayookeemikaalaa(yoo hojjatame gatii qabatamaa isaa barreessi)
    A.RFT (Qorannoo dalagaa kalee,Keraatinii Cr)

    B.Electroolaayitii seeramii/dhiigaa

    C.Giluukoosii dhiigaa

D. Galmee Liippidii

14) Yeroo turtii hospitaalaa (guyyootan barreessi)

15) Bu'aa yaala/wal'aansa booda maalture?

A. Fooyya'e/itti wayyaa'e ☐   B. du'e ☐C.Faallaasaa/itti hammaachuu ☐
D.Walfakkaata(Jijjirama hinqabu) ☐

KUTAA-IV Argannoo ECG

1) Electirookaardiyoogiraafii (ECG)   A. Qajeeloodha   B. Rakkoo qaba

Yoo rakkoo qabaate,rakkicha ibsi

A. Ariitii **a)** ariitii saffisaa(taakiiy-ariytihimaa) **b)** ariitii suutaa(biraadii-ariyhiitmaa)
B. Rukunnaa/ dhahannaa sagalee
2) Rakkoo daddabrsoo

     A. fageenyi gidduu **PR** dheerachuu   ☐   B. QRS bal'aa ☐

3) Rakkoo turtii QT....

     A.QT dheerachuu   ☐   B. QT gabaabbachuu ☐

4) Rakkoo dambalii T....

     A.sirritti olka'uu(tullachuu)   B.diriraa ta'uu   C. Gargaltoo (gad-garagalfamuu)

5) Rakkoo kuta-ST …..irratti

     A. gadi dhooqachuu   B. Olka'uu/fiixee ta'uu

6) Rakkoo dambalii Q...irratti

7) Rakkoo voolteejii(voolteejii hinbaramne)

     A.LVH ☐   B.RVH ☐   C.Voolteejii xiqqaa (gad-aanaa)

  8) Rakkoo siiqqee(Axis abnormality) A. LAD   ☐   B.RAD ☐

9) Rakkoo naanna'uu(naanna'uu hinbaratmne)

     A. faallaa sa'aatii ☐   B.gara sa'aatiin naanna'uutti ☐

10) Rakkoo dambalii P(hinbaramne)…. A. olka'iisa /fiixee qabaachuu ☐ B.Bal'achuu ☐

11) Rakkoolee biroo jiran (ibsi)…..