ELECTROCARDIOGRAPHIC RECORDINGS OF PSYCHIATRIC PATIENTS ATTENDING DAWANAU PSYCHIATRIC HOSPITAL, KANO-NIGERIA

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ABSTRACT
Psychiatric patients are often associated with electrocardiographic (ECG) abnormalities which may in some cases be life threatening due to the effect of anti psychotic drugs they are placed on. This study aims to establish the ECG recordings of these patients and find out if there exist abnormalities in the ECG tracings as documented in the literature. Anthropometric and clinical data were obtained from 323 patients attending Dawanau Psychiatric Hospital between April to May 2017. Result showed there were 12 (3.7%) cases of short PR interval and 15 (5%) of prolonged PR interval. Fifteen (5%) of the subjects have prolonged QTc, 16 (5%) have ST segment elevation while 8 (2.5%) have ST segment depression and 24 (7.4%) have flat T wave. The PR and QT intervals were significantly (p<0.05) lower in females compared to the males, while the corrected QT was significantly (p<0.05) lower in the males than the females. It can be concluded that mild ECG changes exist in these psychiatric patients on antipsychotic drugs, but there was no late ventricular potentials or features of Torsade de pointes.
Keywords: ECG, Antipsychotic drugs, Dawanau, Kano, Nigeria, Psychiatric Patients.

INTRODUCTION

Studies have linked Psychiatric patients with various forms of ECG abnormalities due to effect of antipsychotic drugs (Shah *et al.*, 2014) and this warrant routine screening as neuroleptic drugs are implicated with many of these changes (Warner and Barnes 1996). Tricyclic antidepressants have also being found to have significant effect on the heart particularly the heart rate, blood pressure and intra ventricular conduction (Glassman and Bigger, 2001). They have adverse

cardiovascular effect especially in persons with pre existing heart diseases (Roose *et al.*, 1991). Khasawneh and Shankar (2014) have implicated atypical antipsychotics with many of these abnormalities.

Sudden cardiac arrest has been linked to late potentials in ECG of up to 31% of psychiatric patients (Poncet *et al.,* 2015). Late ventricular potentials (LVPs) have been defined as low amplitude, high frequency waveforms that appear in the terminal part of the QRS complex of the electrocardiogram (Benchimol-Barbosa *et al.,* 2002). In the same vein, some of these drugs have effect on QT interval, causing Torsade de pointes and sudden death in many patients receiving treatment. Notable among these drugs are Thioridazine, Primozine, Sertindole, Droperidol and Haloperidol (Glassman and Bigger, 2001). Other studies found ECG abnormalities like abnormal heart rate, ST segment, QRS complex, T wave, Prolonged or border line QT_c interval, irregular rhythm and prolonged PR interval (Moosa and Chb, 2006).

Mental disorders constitute a prevalence of about 12.1% in Nigeria (Gureje *et al.,* 2006) as such there

may be a lot of patients or apparently healthy persons who may be on these antipsychotics with salient ECG abnormalities. These increasing cases of psychiatric illnesses in our society may have negative effect on the physical and mental well being of those affected. There is thusthe need for this study to find out the extent of the problem so as to offer some suggestions on how to regulate the use of these drugs on the respective patients in order to limit the occurrence of cardiovascular complications. It will also help to generate a baseline data for reference use in our locality.

MATERIALS AND METHODS

Setting

Dawanau psychiatric hospital is located at Dawanau town in Dawakin Tofa local government, 10 kilometers from Kano metropolis. Historically it was used to be called "Turu", a healing centre for Kano emirate even before colonial masters arrived and continued to be such during the colonial era with only a hut build to admit the patients. The centre was upgraded to psychiatric rehabilitation centre in 1980. It has 7 wards with 124 bed capacity, consisting of both male and female patients. The outpatient department receives an average of 200 patients on daily basis. The hospital handles many psychiatric cases including, substance abuse, bipolar disorder, schizophrenia and depression.

Study design

This is a cross sectional study on patients attending the Outpatient Department of Dawanau Psychiatric Hospital.

Study population
A total of three hundred and twenty three (323) Psychiatric patients consisting of both males and females aged between 16 and 60 years were recruited for the study.

Sampling method
Simple Random sampling technique was used in selecting the patients for this study.

Inclusion criteria
Psychiatric patients attending Dawanau Psychiatric Hospital aged between 16-60 years, who were either on medication or not.

Exclusion criteria
Those Psychiatric patients with Cardiopulmonary diseases, chronic illnesses like Diabetes mellitus and chronic liver or kidney diseases were excluded from the study.

Ethical approval
Ethical clearance (MOH/Off/797/T.I/352) was obtained from Ethical Committee of Kano State Ministry of Health and Helsinki declaration codes were adhered to while conducting the study (World Medical Association, 2013).

Data collection
A structured interviewer administered questionnaire was used to record the data obtained. The questionnaire has 3 sections; for Biodata, Anthropometric and clinical information recording respectively.

Biodata section
This includes; Age, sex, address, diagnosis, history of disease and duration of treatment.

Anthropometric data
Weight was recorded on bare feet with light clothing using bathroom weighing scale while the height was recorded using meter rule calibrated on the wall. Body Mass Index (BMI) was calculated by dividing the weight in kilograms with the height squared in metres and was expressed in Kg/M^2 .

Clinical data
ECG was recorded using DECG-03A 12-lead ECG machine by Shenzhen Mindray Bio-Medical Electronics Co. LTD © 2006. Patients lied down on supine position on the examination couch. Small amount of electrolyte jelly was rubbed on the fronts of wrists and above the ankle joint. The limbs electrodes were applied firmly on these points and fixed them in place with rubber straps. Chest leads consisted of V1, V2, V3, V4, V5 and V6. V1 was placed at 4th intercoastal space right parasternal area, V2 at 4th intercoastal space left parasternal area, V3 between V2 and V4, with V4 placed at 5th intercoastal space midclavicular line on the left, V5 at 5th intercoastal space anterior axillary line left and V6 at 5th intercostal space mid axillary line were applied respectively after applying the electrolyte jelly. ECG was recorded after the machine was turned on and tracings recorded on ECG paper as documented in literature (Ghai, 2013). Blood pressure was recorded on all the subjects using Accoson® Mercury sphygmomanometer and Littmann® stethoscope. Patients were seated on a chair and an appropriate cuff was tied on the extended arm. The cuff was attached to the sphygmomanometer and was inflated until no radial pulse was felt. Auscultation with stethoscope was done and the first Korotkof sound heard was recorded as the systolic blood pressure, while the disappearance of the sound was recorded as diastolic pressure (Swash, 2004).

Data analysis
Data collected was analyzed using SPSS version 23 and was presented as mean ± SD, frequencies and percentages. Student t test was used to compare the means between males and females and Chi square test was used to compare categorical variables. Level of significance was set at $P< 0.05$.

RESULTS
Ninety six percent (96%) of the subjects were Hausa-fulani by Tribe. Fifty six percent (56%) were males while 44% were females. Fourty five percent (45%) were single with divorcees making up to 10.8% (35).

Table 1; Socio demographic characteristics of the cohorts.

Parameter	Frequency(N=323)	Percentage(%)
Gender		
Male	182	56.3
Female	141	43.7
Tribe		
Hausa	304	94.1
Fulani	6	1.9
Others	13	4
Marital Status		
Single	146	45.2
Married	135	41.8
Divorced	35	10.8
Widowed	7	2.2
Education		
Non formal	130	40.3
Primary	38	11.8
Secondary	118	36.5
Tertiary	37	11.5

More than 40% of the subjects had non-formal education with 122 (38%) of the respondents having no specific job description.

Table 2; Mean Anthropometric and Cardiovascular parameters of the cohorts.

Parameter	Male	Females	P- Value
Age(years)	32.96±7.94	36.5±11.10	0.001
Weight(Kg)	58.72±9.93	57.96±13.51	0.55
Height(M)	1.67±0.09	1.64±0.08	0.01
BMI	20.18±3.31	23.11±5.06	0.001
Systolic Blood Pressure(MmHg)	111.15±14.57	111.77±19.09	0.74
Diastolic Blood Pressure(MmHg)	66.81±13.45	68.79±15.19	0.21
Pulse Pressure	44.34±13.35	42.97±15.61	0.39
Mean Arterial Pressure	103.86±16.62	106.05±19.70	0.31
Heart Rate	74.74±15.65	90.3±16.93	0.001

t-test among subjects. P<0.05
Females were significantly older and taller (P<0.05). There is no significant difference (P>0.05)
in the mean SBP, DBP and MAP between male and female subjects.

Table 3; Clinical diagnosis of Psychiatric manifestations

Diagnosis	Frequency (n-323)	Percentage (%)
Schizophrenia	110	34.1
Drug (substance abuse) induced Psychosis	107	33.1
Epilepsy	46	14.2
Depression	34	10.5
Other Psychosis	21	6.5
Mania	5	1.5

The commonest cause of psychiatric illness at Dawanau Psychiatric hospital was schizophrenia, accounting for
34.1% followed by drug induced psychosis (33.1%).

Table 4; Mean values of ECG indices among the cohorts

Parameter	Male	Females	P- Value
P-wave(mV)	103.03±16.13	104.7±18.22	0.38
QRS complex(mV)	92.86±10.82	98.5±15.01	0.16
PR Interval(mS)	159.91±30.39	153.39±24.77	0.01
QT Interval(mS)	360.99±29.85	356.23±31.70	0.01
QTc(mS)	398.91±23.30	432.36±27.31	0.01

t-test among subjects. P<0.05
PR and QT were significantly (p<0.05) lower in females compared to males, while corrected QT interval is
significantly (p<0.05) lower in males than in females,

Table 5; Variation of ECG among the cohorts

Parameter		Males n(%)	Females n(%)	Total n(%)	X^2
PR Interval	Short	5(42)	7(58)	12(3.5)	0.55
	Normal	169(57)	127(43)	296(91.5)	
	Prolonged	8(53)	7(47)	15(5)	
QTc	Normal	178(58)	130(42)	308(95)	0.01
	Prolonged	4(27)	11(73)	15(5)	
ST-Segment	Normal	165(55)	134(45)	299(92.5)	0.001
	Elevated	15(94)	1(6)	16(5)	
	Depressed	2(25)	6(75)	8(2.5)	
T-WAVE	Normal	174(59)	122(41)	296(91.5)	0.008
	Inverted	8(33)	16(67)	24(7.5)	
	Flat	0(0)	3(100)	3(1)	

P<0.05
Five percent (5%) of the subjects have prolonged QTc duration and 7.5% have inverted T wave in their ECG
tracings.

DISCUSSION

The result from this study showed schizophrenia ranks highest (34.1%) among the causes of Psychosis in patients attending Dawanau Psychiatric hospital in Kano state Nigeria. This agrees with the work of Sadhya et al. (2009) who documented a prevalence of 42% among his

subjects. Similarly, Afolayan, et al. (2015) documented a prevalence of up to 58% in Neuro Psychiatric Hospital in Port Harcourt, Nigeria. This shows schizophrenia to be the commonest form of mental illness in many centres. It is closely followed by substance abuse with 33%, buttressing the reports by the NDLEA that Kano ranks highest amongst Nigerian states with illicit drug abuse (Dailytrust, 2017). The high prevalence of drug abuse recorded here could be attributed to high rate of unemployment and low literacy level as 37.8% of the subjects were unemployed and 40.3% had no formal education at the time of conducting this study. Other social and cultural factors like marital status and divorce can contribute to the substance abuse among those patients. In this study 45.2% of the subjects were single and 10.8% divorcees. These factors may serve as excuses for the patients to resort to illicit drugs intake resulting to mental illness in the long term. Other studies have also linked mental disorders with high divorce rate and low marriage likelihood (Sadhya et al. 2009; Breslau et al., 2011). Another reason for the high prevalence of drugs related mental illnesses may be the vulnerability stage of the subjects, as majority of them (55%) were within 15-34 years of age. These are the years of experimentation and peer group influence which can lure them into substance abuse with resulting negative consequences of developing mental disorders.

This study found 5% of the patients with prolonged PR Interval (PR>200ms) which is an indicator of first degree heart block, that can lead to long term risk of atrial fibrillation,

pacemaker implantation or may lead to death as documented by (Cheng *et al.*, 2009). This is in keeping with studies done previously that related psychiatric patients with PR Interval prolongation (Moosa and Chb, 2006).

First generation antipsychotics like Chlorpromazine and Haloperidol have been linked with prolonged QTc in many studies and is a cause for alarm as it is an early indicator of Torsade de fontes and sudden cardiac death (Glassman and Bigger, 2001). This study found 5% of the subjects with prolonged QTc who are on various forms of antipsychotic drugs. The QTc is defined as duration in milliseconds corrected for heart rate from ventricular depolarization (Q wave) to end of the T wave. It represents the time it takes for the ventricles to complete depolarization and repolarization processes (Zemrak and Kenna, 2008). Values above 470 msec is considered prolonged for women, while values above 450ms is considered prolonged in men (Zemrak and Kenna, 2008). Variation between males and females has been attributed to be driven by testosterone levels in males (Glassman and Bigger, 2001). Other studies have also found an association between antipsychotic drugs

with prolonged QTc (Carrà *et al.*, 2016), but those patients were taking other drugs known to have caused prolong QTc like alcohol and illicit drug abuse. Second generation antipsychotic drugs like Olanzepine and risperidone have also been linked to prolonged QTc, but with no consistency for linking them to Torsade de Pontes risk (Hasnain and Vieweg, 2014). Taking more than one drug has also been linked to prolonged QTc in those patients (Barbui *et al.*, 2016). None of our subjects was on a single drug, so this can be another reason for QTc prolongation in this study. Although QTc duration was found to be prolonged in our subjects, non develop features of Torsade de Pontes. This may be due to non evidence of risk factors like over dosage or coexisting heart diseases as all our subjects were asked if they have history of preexisting heart disease and those who have were excluded from the study. This underscores the importance of ECG monitoring on Psychiatric patients by clinicians in order to identify the potential candidates for QTc prolongation. It is interesting however, to note that none of these patients had ECG since commencement of their treatment except for this one.

ST segment represents period of ventricular repolarization and is essential for cardiac muscles functions. ST segment is the flat, isoelectric portion of the ECG between the end of the S wave (the J point)

and the beginning of the T wave. The most important cause of ST segment abnormality is either elevation or depression is myocardial ischaemia or infarction This study found up to 5% of the subjects with ST segment elevation and 2.5% with ST segment depression.

Studies by Ishizue *et al.*, (2016) found 12.5% of their subjects with ST elevation, although his subjects were all epileptic and were on either Phenytoin or Carbamazepine which are known to be associated with ST segment abnormality (Lionte *et al.,* 2006). In this study 12% were diagnosed to have epilepsy and were on wide range of anti psychotics and anti convulsants. This could be the reason for lower percentage recorded in our study. This study also found up to 7.4% of the subjects with T wave inversion, and agrees with studies in South Africa by Moosa and Chb, (2006). T wave inversion is a sign of myocardial ischaemia, but coronary angiography was not conducted on these patients, hence full blown M I cannot be ascertained.

CONCLUSION

This study has found 5% of the psychiatric patients with prolonged PR interval, 5% with corrected QT prolongation, 7.4% with inverted T wave morphology and 5% with ST segment elevation. None of them shows sign of Torsade de Pointes.

RECOMMENDATION

All psychiatric patients on antipsychotic drugs should have regular ECG monitoring in order to identify those patients who are potential of developing ECG abnormalities as a result of antipsychotic treatment.

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