



Prevalence and Distribution of Wolff-Parkinson-White Pattern or Syndrome among Young Adult Population in Nigeria

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Authors' contributions

This work was carried out in collaboration between both authors. Authors OO and MAA designed the study, performed the statistical analysis, wrote the protocol, wrote the first draft of the manuscript and managed the analyses of the study. Author OO managed the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

Aims: This study aimed to determine the pattern and distribution of Wolff-Parkinson-White (WPW) pattern or syndrome among young adults.

Study Design: This is a cross-sectional descriptive study.

Place and Duration of Study: Department of Physiological Sciences and ECG Unit, Health Centre, Obafemi Awolowo University, Ile-Ife, between March 2014 and December 2016.

Methodology: Young adult population in the University Community was screened with ECG as part of medical screening procedure. Screening lasted over a period of 3 years.

The participants had their resting standard 12-lead ECG recorded according to internationally approved protocol. The ECG strips were screened for WPW pattern or syndrome.

Results: Nine thousand eight hundred and twenty six (9826) young adults (48% males, 52% females) within the age range of 15 - 40 years were screened. Eleven (11) cases (7 males and 4 females) of WPW pattern were diagnosed. No case of WPW syndrome was detected. The prevalence of WPW pattern in the study population was 0.11%. Out of the 11 cases, 7 (6 males

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and 1 female) had stable WPW pattern while 4 (1 male and 3 females) had intermittent WPW pattern. More than half (57.14%) of the cases with stable WPW pattern presented with sinus bradycardia while others present with normal heart rate. Intermittent WPW pattern mimicked premature ventricular ectopic beats. The dominant type of WPW pattern in the study was type B. **Conclusion:** This study concluded that the prevalence of WPW pattern was 0.11% and that the pre-excited ECG was more frequent in males. The dominant form of WPW pattern is type B which asymptotically presented with bradyarrhythmia.

Keywords: Prevalence; distribution; Wolff-Parkinson-White pattern or syndrome; adult; Nigerians.

1. INTRODUCTION

In 1930, three physicians, Louis Wolff, Sir John Parkinson and Paul Dudley White described a medical entity characterized by bundle branch block with short P-R interval in 11 healthy young people who were prone to paroxysmal tachycardia [1]. None of the patients had any evidence of structural heart disease and administration of atropine to normalize atrioventricular conduction resulted in disappearance of the bundle branch block pattern. The medical entity was later described as Wolff-Parkinson-White (WPW) Syndrome. This syndrome is characterized by the presence of short PR interval, delta wave, broad QRS complexes and a predisposition to tachyarrhythmia [2]. WPW is important in clinical practice because it predisposes to malignant arrhythmias and sudden cardiac deaths especially in the young [3-6]. WPW is a type of pre-excitation condition characterized by the presence of aberrant atrioventricular bundle which bypass the physiological atrioventricular nodal delay [7]. The accessory pathway involved in WPW pattern is bundle of Kent which is central to the pathophysiological mechanisms of the disease. The bundle was first described in by Stanley Kent in 1893 [8,9]. WPW pattern has been linked with PRKAG2 gene located on long arm of chromosome 7 [10-12]. The familial type of WPW pattern is autosomal dominantly inherited and this had been identified and demonstrated in people with familial form of WPW pattern. The syndrome occurred more frequently in males than females [13]. Among Italian population of young adults assessed between 1988 to 1992, Sobo et al. [14] analyzed 116,452 consecutive 12-lead electrocardiograms belonging to the entire cohort of 18-year old young boys and identified identified 173 cases of WPW pattern and reported a calculated incidence of 1.48/1000.

In Nigerian, much of the knowledge concerning the occurrence of WPW pattern or syndrome was

based on information obtained from clinic or admission cases due to lack of ECG based health screening programme. The purpose of this study was to determine the prevalence and distribution of WPW pattern or syndrome among young adults in a tertiary institution in Nigeria.

2. MATERIALS AND METHODS

2.1 Participant Selection

The target population was undergraduate and postgraduate students of a Tertiary Institution in Nigeria. A total of nine thousand eight hundred and twenty six (9826) young adults (4716 males, 5110 females) within the age range of 15-40 years participated in the study between 2014-2016. It was a cross-sectional descriptive study. This study was approved by the Ethics and Research Committee of the Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife. The ECG was included as part of health screening procedures in the University.

2.2 ECG Acquisition Protocol

The standard 12-lead ECG of each participants was obtained in supine position after about 5 minutes of rest during quiet respiration. The participants were enlightened about the protocol and their written consent obtained. Materials like wrist watch, jewellery and mobile phones were removed from the body to reduce electromagnetic interference. The limbs and chest were exposed and electrode placed according to internationally-approved protocol. The chest lead recordings (V1-V6) were obtained by the attachment of six chest electrodes to the precordium according to the conventional methods; V1 at 4th intercostal space right sternal edge, V2 at 4th intercostal space left sternal edge, V3 at the point midway between V2 and V4, V4 at 5th intercostal space left midclavicular line, V5 and V6 were placed respectively at left anterior axillary line and mid-axillary line at same

horizontal line with V4. The four (4) limb electrodes were attached with an electrode to the distal extremity of each limb. Resting standard 12-lead ECG was obtained at a speed of 25 mm/s from each participants. The results were printed out and screened for the presence of WPW pattern or syndrome using Short PR interval, delta wave and broad QRS complexes.

3. RESULTS

Nine thousand eight hundred and twenty six (9826) students (48% males, 52% females) with mean age 22.27 ± 2.37 years participated in the study. Eleven (11) cases (7 males and 4 females) of WPW pattern were diagnosed. No case of WPW syndrome. The prevalence of WPW pattern in the study population was 0.11%. Out of the 11 cases, 7 (6 males and 1 female) had stable WPW pattern [Figs. 1, 2, 3] while 4 (1

male and 3 females) had intermittent WPW pattern [4a&b]. More than half (57.14%) of the 7 cases with stable WPW pattern presented with sinus bradycardia [Fig. 3] while others presented with normal heart rate (60-100 beats per minute). Intermittent WPW pattern mimicked premature ventricular ectopic beats [Fig. 4a &b]. The dominant type of WPW pattern in the study was type B. All the cases with stable WPW pattern presented with Type B variant [Figs. 1-3].

4. DISCUSSION

Prior to this study, WPW syndrome is scarcely reported among adult population in Nigeria and in Africa continent. Moreover, WPW pattern is scarcely reported because most of the cases will remain asymptomatic. Only mass screening or survey using ECG like the present study can assist in detecting cases of WPW pattern

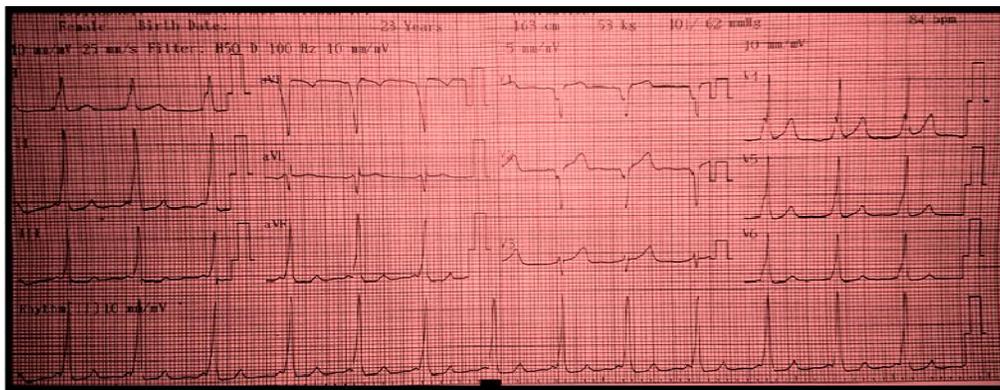


Fig. 1a. ECG of a 23 year old female with stable WPW pattern



Fig. 1b. ECG of a 23 year old female with WPW pattern; short PR interval (blue arrow), delta wave (yellow arrow) and broad QRS complexes (red arrow)

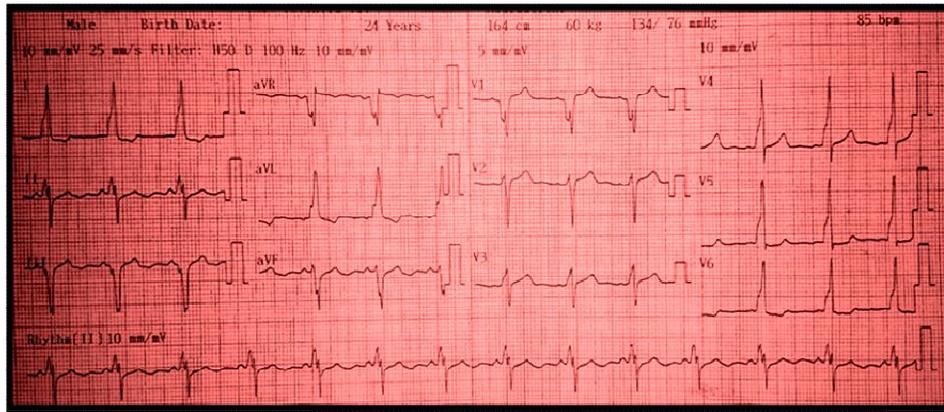


Fig. 2. ECG of a 24 year old male with WPW pattern; short PR interval (0.08s), delta wave and broad QRS complexes, secondary repolarization abnormalities in left lateral leads (I, aVL, V5 & V6)

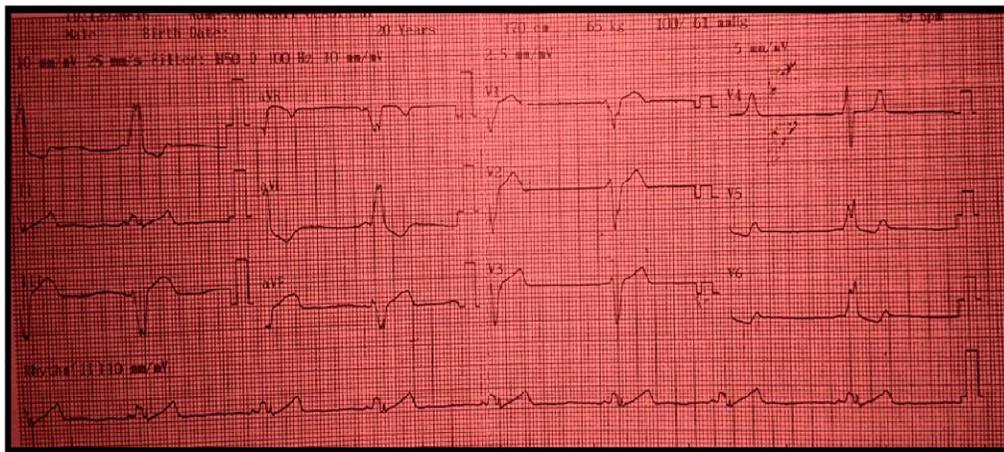


Fig. 3. ECG of a 20 year old male with type B WPW pattern; bradycardia (heart rate of 49 bpm), short PR interval (<0.12s), delta wave and broad QRS complexes, secondary repolarization abnormalities in left lateral leads (I, aVL, V5 & V6)

and ECG is not used for this purpose in Nigeria. Only a few case reports of WPW syndrome had been published from Nigeria and these were hospital based. In 1998, Ajuluchukwu reported five cases of WPW pattern in Lagos University Teaching Hospital, Nigeria [15]. The present study is the first large population survey for WPW pattern or syndrome among the general population in Nigeria. This study showed that one (1) in every 909 young undergraduates among the young adult population had WPW pattern. This is quite significant because the total population of students in the Higher Institution during the period of the study was 35,000. With this, it implies that up to 321 students may have WPW pattern. This may explain a few cases of

unexplained sudden cardiac death in the population. The outcome of present study was in concordance with the study of the 67,375 aviation trainees among which 106 were diagnosed to have WPW pattern with prevalence of 1.6% [16]. In most health facilities in Nigeria, ECG is scarcely available and routine ECG screening is not in place. The findings of this study implied that some potentially deadly but curable conditions such as WPW pattern exist among young adult population in Nigeria despite lack of previous statistics. In developed nations where sudden cardiac deaths may mostly be due to coronary heart disease. In Spain, sudden cardiac death is a remarkable public health challenge because it is responsible for

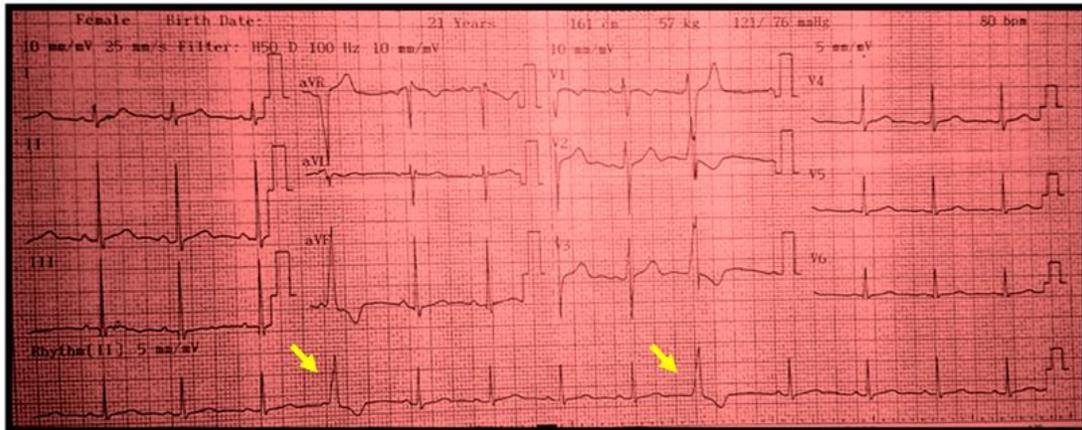


Fig. 4a. ECG of a 21 year old female with intermittent WPW pattern; Pre-excited QRS complexes (yellow arrow) mimicked ectopic beats

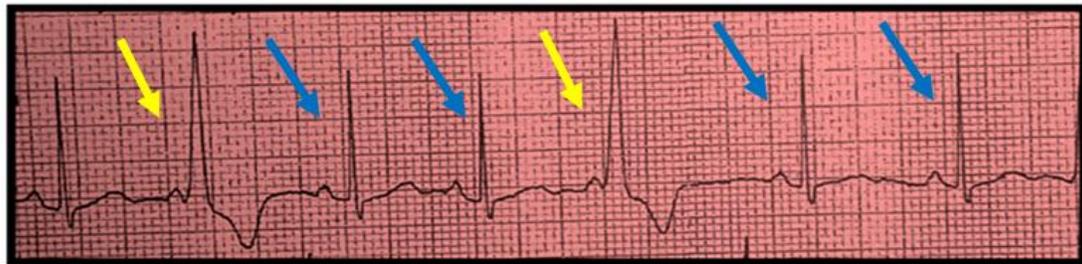


Fig. 4b. ECG of a 21 year old female with intermittent WPW pattern; two pre-excited (WPW) complexes (yellow arrows) with short PR interval (0.08s), broad QRS complexes with delta wave and secondary repolarization abnormality (beats 2 and 5) interrupting sinus beats (blue arrows)

approximately 12% of all natural deaths and 88% of the sudden deaths are of cardiac origin in which more than 50% are due to coronary heart disease [17]. Sudden cardiac deaths in Nigeria especially in the young are under reported and may be related to undiagnosed genetic and congenital arrhythmogenic conditions like WPW pattern [18]. The results of this present study implies that standard 12 lead ECG is a cheap and effective test in detecting asymptomatic arrhythmogenic conditions which can predispose to sudden cardiac death among young adult population in Nigeria. This may justify inclusion of ECG as part of medical screening test for undergraduates in Higher Institutions in the country.

5. LIMITATION

This study only utilized resting standard 12-lead ECG in the mass screening and no follow-up electrophysiological studies is reported because there is no facility for such study in the Country.

6. CONCLUSION

This study concluded that the prevalence of WPW pattern among young adult population in Nigeria was 0.11%. It was observed that the pre-excited ECG was more frequent in males. The dominant form of WPW pattern is type B which asymptotically presented with bradyarrhythmia.

CONSENT

All authors declare that written informed consent was obtained from the patient (or other approved parties) for publication of this paper and accompanying images.

ETHICAL APPROVAL

The authors have obtained all necessary ethical approval from Ethics and Research Committee of Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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