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The one-month prevalence and correlates of psychotic-like experiences in the general adult population in Nigeria

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Abstract

There is now substantial evidence that psychosis exists in a continuum. This study assessed the rate and correlates of distressing psychotic-like events (PLEs) in a non-clinical population in Lagos, Nigeria. A face-to-face household survey was completed by 11,246 adult participants (aged 18-75 years). Clinically significant symptoms of PLE were assessed using the Prodromal Questionnaire Brief Version (PQ-B) while depression, generalized anxiety, and somatic symptoms were assessed using the specific modules of the Patient Health Questionnaire (PHQ) respectively. Family history of mental illness, alcohol use disorders, psychoactive substance use disorders (and specifically cannabis use disorder), and disability were also assessed. The mean age in years was 36.7 (sd = 12.3) with 6,525 (58.0%) females. a total of 7022 (62.4%) endorsed at least one PLE symptom. The mean PQ-B distress score was 2.65 (sd = 4.32) with 1465 (13.0%) categorized as having clinically significant PLE). The regression model showed that only age 18–24 years (OR 1.64), female gender (OR 1.16), history of mental illness in the immediate family (OR 1.46), cannabis use disorder (OR 1.56), and general substance use disorders (OR 1.72) were independently associated with clinically significant PLEs. We have shown clinically significant PLEs symptoms are relatively common in non-help-seeking Nigerian adults and both genetic and environmental factors may play a role. A follow-up study to ascertain the short-term progression of participants in this study in terms of changes in PLE status, the transition to psychosis or other mental health disorders, and contact with mental health services is currently underway.

Keywords Psychotic-like-experience · Epidemiology · General population · Nigeria · Correlates · Prevalence

Introduction

Psychosis occurs worldwide and is associated with a high level of stigma and discrimination (Serafini et al., 2011). There is now substantial evidence that psychosis exists on a continuum and that symptoms of psychotic disorder can be found in the general population in the form of psychotic-like experiences (PLEs) such as fleeting hallucinations, suspiciousness/paranoia, and magical thinking (McGrath et al., 2015; Pignon et al., 2018). Numerous epidemiological studies have also shown that PLEs are associated with the later development of psychosis, other mental disorders and some general physical disorders (Kırlı et al., 2019). PLEs have also been associated with increased disability and an increased likelihood to report concurrent suicidal ideation and attempts (Bromet et al., 2017).

The prevalence of PLEs in population samples has varied widely in recent literature. Recent data from 34,653 individuals in the US showed that 26.69% of respondents reported at least one PLE in their lifetime (Bourgin et al., 2020). In France, data collected from 38,694 individuals also showed lifetime prevalence of PLEs to be 22.3% among the adult population (Pignon et al., 2018). The WHO World Mental Health (WMH) Survey, based on a cross-national analysis of over 31,000 respondents found that the mean lifetime prevalence of PLEs was 5.8%, with hallucinatory

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experiences (5.2%) much more common than delusional experiences (1.3%) (McGrath et al., 2015). Apart from the genetic liability to psychosis in general (Fusar-Poli et al., 2014), many studies have identified younger age, lower education and income, unemployment, and not being married as sociodemographic predictors of PLEs (McGrath et al., 2015; Bourgin et al., 2020). A strong association has also been reported between PLEs and the use of cannabis and other psychoactive substances (Degenhardt et al., 2018).

However, there are still important knowledge gaps in the epidemiology of PLEs. Firstly, most of the available studies considered lifetime rates. Apart from being prone to the problem of recall bias, lifetime rates in adults are likely to include a description of childhood experiences that may not be verifiable as findings have suggested that little weight can be placed on the retrospective reports of details of early experiences (Hardt & Rutter, 2004). Secondly, most of the prevalence rates reported in earlier studies were for the presence of one or more PLE, and criteria for distress were not included. Distress is an important predictive factor of the transition from subclinical PLE to clinical psychosis (Murphy et al., 2018). It is known that most fleeting PLEs are not associated with distress and do not lead to a clinical disorder, and as such, may not warrant clinical intervention (Murphy et al., 2018). We, therefore, believe that focusing on recent and distressing symptoms to identify clinical high-risk (CHR) individuals may be the key to providing effective preventative intervention for healthy individuals who experience PLEs. Thirdly, most of the earlier studies have enrolled help-seeking individuals and this might have increased the likelihood of distressing symptoms. Only a few studies have been done in a non-help-seeking population. Lastly, most of the studies on PLEs were done in high-income countries. Large epidemiological studies in the general population are rare in developing countries, especially in sub-Saharan Africa. The few available ones (Adewuya et al., 2021; Okewole et al., 2015a; Ndetei et al., 2012; Temmingh et al., 2011) had been done either among a narrow age group of adolescents/young adults or had assessed for singular, non-distressing symptoms with limited clinical significance. Studies have reported wide variation in the prevalence of psychotic experiences in groups of people from different regions of the world (Vermeiden et al., 2019). It is evident that there are cultural variations in the manifestation of psychotic experiences with up to 15–30% of psychosis expression noted to be culture-dependent (Vermeiden et al., 2019). Therefore, the modulating factors for the PLE-Psychosis continuum may be more apparent in different socio-cultural settings (Stompe et al., 2006).

Nigeria is the 7th most populous country in the world and the most populous country in Africa. Lagos state has a population of nearly 20 million, accounting for about 10% of Nigeria's population with all the ethnic groups in the country well represented. The Lagos State Mental Health Survey (LSMHS) was initiated to assess the types, patterns, and severity of common mental health problems among citizens of Lagos State. The survey collected data from 11,246 participants. The overall aim of this study was to assess the rate and correlates of recent PLEs among adult residents of Lagos, Nigeria using data from the LSMHS. Our specific objectives for the present study were to 1) establish the prevalence of PLEs in the past month; 2) determine the proportion of "clinically significant" PLEs by assessing their accompanying levels of distress; 3) investigate the relationships between clinically significant PLEs with sociodemographic characteristics as well as with the family history of mental illness, concomitant depressive and anxiety symptoms, substance use, and disability. We hypothesize that (a) the prevalence of PLE among the general adult population in Nigeria will not be significantly different from that obtainable earlier in developing or developed cultures; (b) sociodemographic, family history, clinical data and functional status will not be associated with clinically significant PLE symptoms.

Materials and Method

Sampling and Participants' Recruitment

The sampling and recruitment method has been described earlier (Adewuya et al., 2018), and a summary is provided here. The multistage procedure involved the random selection of two Local Council Development Authorities (LCDAs) from each of the 5 administrative divisions of Lagos. From the selected LCDAs, enumeration areas (EAs) were determined according to the National Population Commission (NPC) demarcation. Listing of all the housing units and households in each EA showed an average of 3–5 households per housing unit. These lists were entered into a centralized computer data file thus creating a sample in which the probability of any individual household being selected to participate in the survey was equal for every household within an EA. Based on probability according to the size of the administrative divisions (Ikeja-35%, Ikorodu-30%, Badagry-13%, Lagos Island -12% and Epe-10%), systematic random sampling was used to select 5720 housing units. In the final stage of the selection, 2 households were randomly selected from a housing unit (making 11,440 households in all). Figure 1 showed a flowchart for the sampling and recruitment. The full list of all residents in each household above 18 years was obtained and the Kish table selection method was used to select one eligible person as the respondent from each household. The Kish method is essentially designed to ensure that the person most likely to answer a question is not different in a specific way from

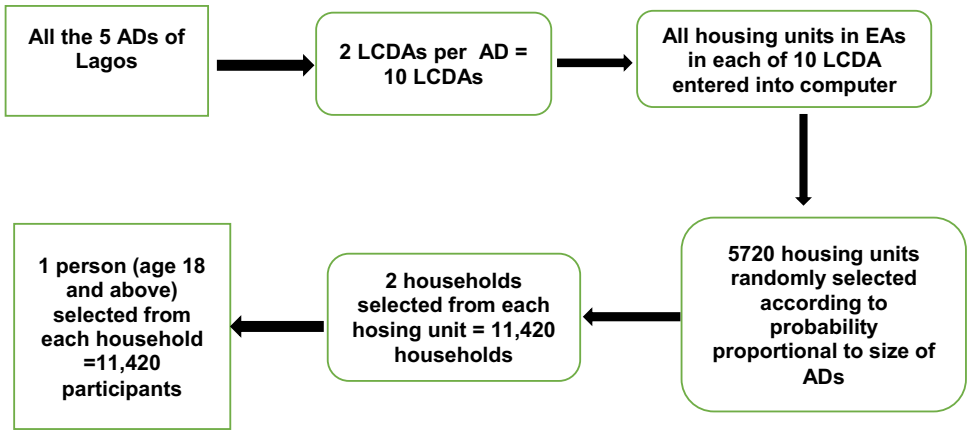

Fig. 1 A flow-chart of the sampling and Participants recruitment for the Lagos State Mental Health Survey (LSMHS). *ADs* Administrative Divisions (Ikeja, Ikorosu, Badagry, Lagos Island & Epe), *LCDAs* Local Council Development Areas, *EA* Enumeration Areas

the rest of the population. When the primary respondent was either unavailable following repeated calls or refused participation, no replacement was made within the household. Patients with a history of mental illness (diagnosed, admitted or ever sought help) are excluded.

Instruments

The LSMHS booklet consisted of the following

Socio-demographic details: This included age, gender, occupation, working status, marital status, ethnicity, highest education, religion, and region.

Psychotic-like experiences (PLEs): The experience of psychotic-like symptoms in the past month was assessed with the Prodromal Questionnaire-Brief Version (PQ-B) (Loewy et al., 2011). The 21 item PQ-B is a self-report measure that is an effective and efficient instrument for screening psychosis risk. Respondents indicate the presence or absence of each of the positive symptom items with a "Yes/No" response. For each of the endorsed symptoms, respondents who check "Yes" are asked to indicate the extent the symptoms cause distress on a 5-point Likert scale from 0 to 5. The "*total score*" is the sum of each item marked "Yes" (maximum score 21) while the "*distress score*" is the sum of each item's score on the Likert scale (maximum score 105). It has been validated in Nigeria with good psychometric properties (Okewole et al., 2015b). In the Nigerian validation study against the Structured Interview for Prodromal Symptoms (SIPS) as the gold standard, PQ-B correlated well with scores on the SIPS (Spearman's r = 0.582, $p < 0.001$). The PQ-B had a Cronbach's alpha of 0.844. The area under the curve, AUC for the PQ-B scores was 0.822 (95% CI 0.728–0.916, $p < 0.001$). With endorsement of distress, the AUC was 0.810 (95% CI 0.728–0.893, $p < 0.001$). The authors of the scale recommend either a total score of 3 or a distress score of 6 and above but strongly advocated using the distress score cut off to maximize sensitivity and specificity (Loewy et al., 2011). We adopted the distress cut-off score in this study. Since dissociative and other phenomena often mimic PLEs, we followed the PQ-B with questions to ascertain if the reported symptoms occurred when the person was not dreaming, not half asleep, or under the influence of drugs/alcohol. We also asked if the individual considered the experiences as coming from within him/her or completely outside the body (Humpston et al., 2016).

Common Mental Disorders: These were assessed with the different modules of the Patient Health Questionnaire (PHQ). Major Depressive Disorder (MDD) was assessed using the 9-item Depression module (PHQ-9) (Kroenke et al., 2001), while Generalized Anxiety Disorder (GAD) was assessed with the 7-item Generalized Anxiety module (GAD-7) (Spitzer et al., 2006), and Somatic disorder was assessed using the 15-item Somatic module (PHQ-15) (Kroenke et al., 2002). These components of the PHQ have been validated in Nigeria with good psychometric properties, with a score of 10 and above (sensitivity 0.846, specificity 0.994, PPV 0.750, NPV 0.996 and OCC rate 0.992) considered diagnostic for MDD, GAD, and Somatic Disorders respectively (Adewuya et al., 2006).

Alcohol Use Disorders, Psychoactive substances in general and cannabis in particular: This was assessed using the alcohol and substance use disorder module of the Mini International Neuropsychiatric Interview (M.I.N.I) (Sheehan et al., 1998).

Family history of mental illness was obtained by asking if any member of the participants' immediate family (father, mother, sibling, children) or extended family (uncles, aunts, cousins, nephews, nieces) has had/currently has a mental illness.

Disability was assessed using the 12-item version of the WHO Disability Assessment Schedule (WHODAS 2.0) (Ustün et al., 2010). Respondents were asked to state the level of difficulty experienced taking into consideration how they usually carry out the activity, including the use of any assistive devices and/or the help of a person. For each item, individuals have to estimate the magnitude of the disability during the previous 30 days using a five-point scale (none = 1, mild = 2, moderate = 3, severe = 4, extreme/cannot do = 5). It has been validated in Nigeria with the Nigerian version found to have good internal consistency (α = 0.75–0.97); intraclass correlation coefficients (ICC = 0.81–0.93); standard error of measurements (5.05–11.10) and minimal detectable change (13.99–30.77) (Igwesi-Chidobe et al., 2020).

Ethical Considerations

The International Guidelines for Ethical Review of Epidemiological Studies were followed throughout the project. Considerations regarding confidentiality and the protection of research participants from harm, invasion of privacy, and the provision of emotional and practical support were given priority. The Ethics and Research Committee of the Lagos State University Teaching Hospital (LASUTH) gave ethical approval for the project. Written informed consent (in their preferred language) was obtained from the participants before the questionnaire was administered. The informed consent forms were in English, Pidgin English (spoken by nearly 80% of the Lagos population), and the three major Nigerian languages (Yoruba, Igbo, and Hausa).

Pre-field work training and pilot study: Research assistants ($n = 50$), supervisors ($n = 5$), monitors ($n = 3$), and the overall coordinator ($n = 1$), who were all experienced field workers of the NPC with at least a university degree, underwent one-week of standardized training in interviewing skills and in the administration of the questionnaire. Training included field practical and dummy exercises. A pilot study was done to familiarize ourselves with the project sites.

Procedure and Quality Control

The data was collected over four weeks from August to September 2015. Data collection was via face-to-face interviews using the paper and pencil method. To increase self-disclosure, self-completion of the questionnaire booklet was encouraged for literate participants who were given the self-administered booklets (in any language of their choice). For the non-literates, the questionnaires were read to them in private and their responses ticked.

Data Analysis

Data was centrally analyzed using the IBM SPSS Statistics for Windows Version 22. Results were calculated as frequencies (%), means, and standard deviations. To calculate the rate of PLEs in the total sample, participants with PLE distress scores of 6 or more were categorized as high risk. The PQ-B scores were analyzed using Mean (SD) scores. As the scores were normally distributed, we first conducted Pearson's correlation analysis between the PQ-B scores and continuous variables (age, PHQ-9, GAD-7, PHQ-15, and WHODAS scores). To minimize the effects of extreme values, we also dichotomized the continuous scores using recommended cut-off values and performed categorical analysis (Chi-square) with all socio-demographic and clinical variables. For the multivariate analysis, we conducted a multiple Logistic regression analysis modelling with the dichotomized PLEs scores (PLE positive and PLE negative) as the independent variable. The predicting variables that were significant in the earlier bivariate analysis were then entered into the regression model. In the results, the logistic regression coefficients were converted to odds ratio and 95% Confidence Interval (95 CI) for ease of interpretation. Statistical significance was set at 0.05.

Results

Sociodemographic Characteristics

A total of 11,246 out of the 11,414 participants completed the questionnaire (98.5% response rate). The mean age was 36.62 (SD 12.81) with a majority (73.1%) of the participants in the age group 25–54 years. There were 4,721 (42.0%) males; 6,525 (69.3%) were married; 8,787 (78.2%) had at least secondary education; 7,526 (66.9%) were either petty traders or artisans; 2,867 (25.5%) were not presently employed; 5,503 (48.9%) were of Yoruba tribe and 6,276 (55.8%) were Christians. There were 384 (3.4%) and 621 (5.5%) participants with a family history of mental illness in their immediate and extended families. Table 1 shows the detailed sociodemographic characteristics of the participants.

Prevalence of Depression, Anxiety, Substance Use, and Disability

The mean score for PHQ-9 was 2.29 (SD = 3.64), for GAD-7 was 2.63 (SD = 3.01) and for PHQ-15 was 3.58 (SD = 3.43).

Table 1 Socio-demographic details of the participants in the Lagos State Mental Health Survey (LSMHS)

	Total ($n=11,246$)	%
Administrative regions		
Ikeja	3,989	35.5%
Ikorodu	3,280	29.1%
Badagry	1,508	13.4%
Lagos Island	1,369	12.2%
Epe	1,100	9.8%
Age range		
18–24 years	1,758	15.6%
25–54 years	8,220	73.1%
55–64 years	895	8.0%
> 64 years	373	3.3%
Mean (SD) age = 36.75 (12.3)		
Sex		
Male	4,721	42.0%
Female	6,525	58.0%
Marital status		
Single	2,624	23.3%
Married (+ Cohabiting)	7,797	69.3%
Divorced /Widowed	825	7.3%
Highest educational level		
No education	575	5.1%
Primary	1,884	16.8%
Secondary	5,958	53.0%
Tertiary	2,829	25.2%
Occupation		
Housewife/student/retiree	2,018	17.9%
Petty Trader/Artisan	7,526	66.9%
Civil servant	771	6.9%
Professionals /Business	931	8.3%
Working status		
Presently working	8,379	74.5%
Presently not working	2,867	25.5%
Ethnicity		
Yoruba	5,503	48.9%
Igbo	2,214	19.7%
Hausa	1,822	16.2
Others	1,707	15.2%
Religion		
Christianity	6,276	55.8%
Islam	4,490	39.9%
Others	480	4.3%

Using the various cut-off scores, there were 758 (6.7%) participants with clinically significant depression symptoms, 518 (4.6%) with clinically significant anxiety symptoms, and 712 (6.3%) with clinically significant somatic symptoms. The MINI was able to identify 976 (8.7%) with alcohol use disorders (AUD), 237 (2.1%) with substance use disorders (SUD), and 172 (1.5%) with cannabis use disorders specifically. The mean WHODAS score was 4.45 (SD = 6.94) and with the recommended cut-off score, a total of 1,239 (11.0%) were categorized as having at least moderate disability. Table 2 shows the full mental health, substance use, and disability characteristics.

Prevalence of Clinically Significant PLEs

The were 7022 (62.4%) respondents with at least one endorsed PLE on PQ-B. The mean PQ-B distress score was 2.65 (SD = 4.32, range 0–26) and 13.0% ($n=1465$) had scores of 6 and above on the distress scale (considered as clinically significant PLE). Only 103 participants endorsing at least one PLE considered that the symptoms were within their body and all of them had PQ-B total distress score below 6. Table 3 shows that the top 5 most endorsed distressing symptoms on the PQ-B items were item 12 (worry that something is wrong with the mind), item 14 (confused whether something was real), item 15 (beliefs that are unusual or bizarre), item 18 (mistrust or suspicious of people) and item 21 (hard to understand what is said).

Correlates and Predictors of Clinically Significant PLEs

The PQ-B distress scores were significantly negatively correlated with age (r = -0.60, $p<0.001$) and positively correlated with depression (PHQ-9) scores (r = 0.028, $p=0.003$). However, there was no significant correlation between the PQ-B distress scores and anxiety symptom (GAD-7) scores (r = 0.015, $p=0.124$), somatic symptom (PHQ-15) scores (r = 0.009, $p=0.316$), and disability (WHODAS) scores (r = 0.017, $p=0.118$). On bivariate analysis, age groups ($p<0.001$), gender ($p<0.001$), marital status ($p=0.024$), depression ($p<0.001$), all substance use disorders ($p=0.030$), cannabis use disorder ($p=0.004$), disability ($p=0.006$) and history of mental illness in the immediate family ($p<0.001$) were significantly associated with clinically significant PLEs (Table 4). In the logistic regression model, age 18–24 years (OR 1.64, 95% CI 1.09–2.46), female gender (OR 1.16, 95% CI 1.01–1.32), history of mental illness in the immediate family (OR 1.46, 95% CI 1.12–1.91), cannabis use disorder (OR 1.56, 95% CI 1.07–2.29) and substance use disorders (OR 1.72, 95% CI 1.19–2.48) were independently associated with clinically significant PLEs (Table 5).

Discussion

Preamble

In this study, we found that nearly 2/3 of the adult population had experienced at least one PLE in the past month and that

Table 2 Common mental disorders, substance use, disability, family history and PLEs

	Mean (SD)	Frequency ($n = 11,246$)
Common mental disorders		
Mean PHQ-9 scores	2.29 (SD = 3.64)	
Clinically significant Depression symptoms		758 (6.7%)
Mean GAD-7 scores	2.63 (SD = 3.01)	
Clinically significant Anxiety symptoms		518 (4.6%)
Mean PHQ-15 scores	3.58 (SD = 3.43)	
Clinically significant somatic symptoms		712 (6.3%)
Alcohol and other substance use disorders		
Alcohol use disorder		976 (8.7%)
Other substance use disorders		237 (2.1%)
Cannabis use disorder		172 (1.5%)
Level of functioning		
Mean WHODAS scores	4.45 (SD = 6.94)	
Moderate-severe disability		1239 (11.0%)
Family history of mental illness		
In immediate family		384 (3.4%)
In extended family		621 (5.5%)
Psychotic like experiences (PLEs)		
Mean PQ-B distress scores	2.39 (SD = 3.26)	
Distress score 0 on PQ-B		4, 224 (37.6%)
Distress score 1–5 on PQ-B		5,557 (49.4%)
Distress score 6 and above on PQ-B		1,465 (13.0%)

about 13% were clinically significant, insofar as they experienced significant accompanying distress. We also found that younger age, female gender, family history of mental illness, cannabis use disorder, and substance use disorders are independently associated with clinically significant PLEs. To our knowledge, our study is the largest general population study to examine PLEs in Sub-Saharan Africa,

Rate of PLEs

Although available studies have used different criteria, our finding of 62.4% endorsing at least one PLE symptom is comparable to other findings of 83.5% in Spain (Fonseca-Pedrero et al., 2016), 51.4% in Tunisia (Fekih-Romdhane et al., 2021) and 69.5% in China (Xu et al., 2016). Our figure is much higher than 26.7% found in the USA (Bourgin et al., 2020) and 23.3% in Sudan (Ayazi et al., 2016). Earlier, among adolescents and youths, the rate of at least one PLE symptom had been 19.2% in Kenya (Ndetei et al., 2012). Meanwhile, our rate of 13% for those with accompanying distress is comparable with the rate of 16% of clinical high-risk individuals found in a community sample of adolescents in Spain (Fonseca-Pedrero et al., 2016) and much lower than the 30.8% who were above the ultra-high-risk threshold found in young adults in Brazil (Loch et al., 2017). Differences in sample populations, assessment instruments, and PLE criteria applied are likely to explain much of the wide variation reported across studies. There are however other possible reasons for the wide variation in different populations. Firstly, cross-cultural differences in language and social norms may account for some of the differences. Cultural values, beliefs, and attitudes define a society's understanding of the concept of reality and influence its response to psychotic phenomena (Larøi et al., 2014). For example, culture-centred explanations of delusional content are likely to affect the rate of endorsement of symptoms, especially in an African setting where beliefs in witchcraft, mystics, and supernatural powers and events are rife Secondly, we used a self-rating scale to measure PLEs in our study, and rating scales typically tend to generate higher rates of an endorsement than diagnostic interviews We are however confident in the validity of our results, given the following: Our sample size was relatively large; our sampling method was robust; we assessed a non-clinical, non-help seeking population; we included adults spanning across a wide age range; we limited our prevalence period to the past month to reduce recall bias, and we used a rating scale specifically designed to detect clinically significant PLE symptoms.

Correlates of Clinically Significant PLEs

As found in earlier population-based studies (McGrath et al., 2015), we confirm that PLEs are significantly more common among adolescents and younger adults than among older age

Table 3 The frequency and mean distress scores of the PQ-B items

	PQ-B Items	YES		Distress Score
		frequency	%	Mean (SD)
1	Do familiar surroundings sometimes seem strange, confusing, threatening, or unreal to you?	1147	10.2%	0.14 (SD = 0.48)
2	Have you heard unusual sounds like banging, clicking, hissing, clapping, or ringing in your ears?	1732	15.4%	0.24 (SD = 0.64)
3	Do things that you see appear different from the way they usually do (brighter or duller, larger or smaller, or changed in some other way)?	765	6.8%	0.13 (SD = 0.54)
4	Have you had experiences with telepathy, psychic forces, or fortune-telling?	1934	17.2%	0.33 (SD = 0.84)
5	Have you felt that you are not in control of your own ideas or thoughts?	1158	10.3%	0.20 (SD = 0.68)
6	Do you have difficulty getting your point across, because you ramble or go off the track a lot when you talk?	2294	20.4%	0.34 (SD = 0.74)
7	Do you have strong feelings or beliefs about being unusually gifted or talented in some way?	2755	24.5%	0.50 (SD = 1.00)
8	Do you feel that other people are watching you or talking about you?	2598	23.1%	0.40 (SD = 0.84)
9	Do you sometimes get strange feelings on or just beneath your skin, like bugs crawling?	1383	12.3%	0.18 (SD = 0.56)
10	Do you sometimes feel suddenly distracted by distant sounds that you are not normally aware of?	3193	28.3%	0.53 (SD = 0.95)
11	Have you had the sense that some person or force is around you, although you couldn't see anyone?	2519	22.4%	0.28 (SD = 0.56)
12	Do you worry at times that something may be wrong with your mind?	3205	28.5%	0.54 (SD = 1.05)
13	Have you ever felt that you don't exist, the world does not exist, or that you are dead?	551	4.9%	0.07 (SD = 0.34)
14	Have you been confused at times whether something you experienced was real or imaginary?	3621	32.2%	0.66 (SD = 1.07)
15	Do you hold beliefs that other people would find unusual or bizarre?	3284	29.2%	0.54 (SD = 0.96)
16	Do you feel that parts of your body have changed in some way, or that parts of your body are working differently?	1271	11.3%	0.15 (SD = 0.46)
17	Are your thoughts sometimes so strong that you can almost hear them?	1709	15.2%	0.21 (SD = 0.54)
18	Do you find yourself feeling mistrustful or suspicious of other people?	3,587	31.9%	0.54 (SD = 0.94)
19	Have you seen unusual things like flashes, flames, blinding light, or geometric figures?	1,585	14.1%	0.25 (SD = 0.71)
20	Have you seen things that other people can't see or don't seem to see?	1046	9.3%	0.15 (SD = 0.54)
21	Do people sometimes find it hard to understand what you are saying?	3,486	34.2%	0.49 (SD = 0.76)

groups. PLEs have been documented to be most frequent during the developmental period and tend to become less common with age and its persistence beyond adolescence has been hypothesized to be indicative of a more serious underlying psychopathological process and is often considered as an early and non-specific forerunner of later mental health problems (Lancefield et al., 2016). Earlier hypotheses to explain the high rate of PLEs in young adults included higher rates of cannabis use by young adults and greater exposure to unusual or culturally incongruent ideas such as witchcraft and paranormal experiences through media or the Internet (Njenga, 2007).

Our finding of a preponderance of females reporting PLEs, and associated distress is in line with earlier studies (Stainton et al., 2021). It has been postulated that gender differences in psychiatric morbidity may partly be caused by the effects of sex hormones on brain development and functioning on the one hand and partly by social factors such as learning and gender roles that influence emotions and behaviours on the other hand (Stainton et al., 2021).

As with earlier reports, we found a history of mental illness in the immediate family (but not the extended family) to be strongly associated with clinically significant PLEs. Previous twin studies reported modest heritability of PLEs, with genetic influences explaining up to half of the variance (Jeppesen et al., 2015). Recent studies have also shown that experiencing PLEs was significantly predicted by a history of psychosis in first-degree relatives, whereas mental disorders in second-degree relatives showed no effects on the risk of PLEs (Jeppesen et al., 2015).

In line with earlier studies, we found cannabis use disorder to be significantly associated with clinically significant PLEs. Evidence from several epidemiological studies suggests that the risk of psychotic symptoms is higher amongst individuals who use cannabis (Di Forti et al., 2019; Marconi et al., 2016). It has also been suggested that cannabis may affect individuals at high risk for psychosis by briefly inducing psychotic-like experiences and impairing their cognition (Vadhan et al., 2017). The association between cannabis and PLEs had been proposed to be partly explained by a shared genetic linkage (Power et al., 2014). But despite the strong contribution of shared genetic factors, frequent and problematic cannabis use also appears to be associated with PLEs via person-specific pathways (Karcher et al., 2019). There is presently a controversy on whether the cessation of cannabis use is associated with greater psychotic-like experiences or

Table 4 Bivariate analysis of sociodemographic and clinical variables

Variables	Total ($n=11,246$, %)	PLE ($n=1465$, %)	No PLE ($n=9,781$, %)	Diff P -value	95% CI
SOCIO-DEMO VARIABLES					
Age range, n (%)					
• 18–24 years	1,758 (15.6%)	287 (19.5%)	1471 (15.0%)	**< 0.001**	**1.14–2.37**
• 25–54 years	8,220 (73.1%)	1036(70.7%)	7184 (73.4%)		0.86–1.72
• 55–64 years	895 (7.6%)	102 (7.0%)	793 (8.1%)		0.72–1.62
• > 64 years	373 (3.3%)	40 (2.7%)	333 (3.4%)		1 (ref)
Sex (female)	6,525 (58.0%)	922 (62.9%)	5603 (57.3%)	**< 0.001**	1.13–1.42
Marital status					
• Single	2,624 (23.3%)	358 (24.4%)	2266 (23.2%)	**0.024**	**1 (ref)**
• Married/Cohabit	7,797 (69.3%)	978 (66.8%)	6819 (69.8%)		0.80–1.42
• divorced /Widowed	825 (7.4%)	129 (8.8%)	696 (7.1%)		0.94–1.47
Highest education					
• No education	575 (5.1%)	84 (5.7%)	491 (5.0%)	0.372	0.92–1.57
• Primary	1,884 (16.8%)	259 (17.7%)	1625 (16.6%)		0.94–1.34
• Secondary	5,958 (53.0%)	771 (52.6%)	5187 (53.0%)		0.92–1.20
• Tertiary	2,829 (25.1%)	351 (24.0%)	2478 (25.3%)		1 (ref)
Occupation					
• Housewife/stud/retiree	2,018 (17.9%)	279 (19.0%)	1739 (17.8%)	0.526	0.96–1.57
• Petty Trader/Artisan	7,526 (66.9%)	985 (67.2%)	6541 (66.9%)		0.93–1.43
• Civil servant	771 (6.9%)	93 (6.3%)	678 (6.9%)		0.78–1.40
• Professionals	931 (8.3%)	108 (7.4%)	823 (8.4%)		1 (ref)
Presently not working	2,867 (25.5%)	391(26.7%)	2476 (25.3%)	0.260	0.95–1.22
Ethnicity					
• Yoruba	5,503 (48.9%)	713 (48.7%)	4792 (49.0%)	0.832	1 (ref)
• Igbo	2,214 (19.7%)	279 (19.0%)	1935 (19.8%)		0.83–1.13
• Hausa	1,822 (16.2%)	242 (16.5%)	1580 (16.2%)		0.72–0.98
• Others	1,707 (15.2%)	231 (15.8%)	1476 (15.1%)		0.89–1.24
Religion					
• Christianity	6,276 (55.8%)	838 (57.2%)	5,438 (55.6%)	0.244	0.94–1.74
• Islam	4,490 (39.9%)	575 (39.2%)	3,915 40.0%)		0.89–1.67
• Others	480 (4.3%)	52 (3.5%)	428 (4.4%)		1 (ref)
CLINICAL VARIABLES					
Depression (Yes)	758 (6.7%)	132 (9.0%)	626 (6.4%)	**< 0.001**	1.18–1.77
Anxiety (Yes)	518 (4.6%)	78 (5.3%)	440 (4.5%)	0.160	0.92–1.53
Somatic disorder (Yes)	712 (6.3%)	102 (7.0%)	610 (6.2%)	0.287	0.90–1.40
AUD (Yes)	976 (8.7%)	141 (9.6%)	835 (8.5%)	0.168	0.94–1.38
All SUDs (Yes)	237 (2.1%)	42 (2.9%)	195 (2.00%)	**0.030**	1.01–2.04
CUD (Yes)	172 (1.5%)	35 (2.4%)	137 (1.4%)	**0.004**	1.15–2.52
Disability (Yes)	1239 (11.0%)	192 (13.1%)	1,047(10.7%)	**0.006**	1.06–1.49
Immediate fam Hx (Yes)	384 (3.4%)	74 (5.1%)	310 (3.2%)	**0.001**	1.24–2.11
Extended Fam hx (Yes)	621 (5.5%)	91 (6.2%)	530 (5.4%)	0.215	0.91–1.46

Variables with statistical significance are in Bold

not (Daedelow et al., 2021). Three hypotheses emerging as potential explanations for the association between cannabis and psychosis are that cannabis is a trigger for psychosis; that it is used to mitigate psychotic symptoms; or that there are common factors that account for its association with psychosis (Hamilton & Monaghan, 2019).

Apart from cannabis, we found that general substance use disorders are associated with clinically significant PLEs. This is in line with recent studies that have linked commonly used substances such as tobacco and alcohol with PLEs (Degenhardt et al., 2018, Bhavsar et al., 2018). It is to be noted that the associations between PLEs and substance use

Table 5 Multiple logistic regression analysis

Variables	B	S.E	Wald	Df	Sig	Exp (B)	95% CI
Age							
• > 64 years			7.158	3	0.067	1 (ref)	
• 18–24 years	0.452	0.210	4.625	1	0.032	**1.571**	**1.041–2.371**
• 25–54 years	0.262	0.191	1.882	1	0.032	1.299	0.894–1.887
• 55–64 years	0.273	0.212	1.663	1	0.197	1.314	0.868–1.988
Sex (female)	0.135	0.069	3.868	1	0.049	**1.145**	**1.000–1.310**
SUD (Yes)	0.553	0.188	8.654	1	0.003	**1.739**	**1.203–2.513**
CUD (Yes)	0.421	0.197	4.575	1	0.032	**1.524**	**1.036–2.243**
Disability (Yes)	0.081	0.091	0.781	1	0.377	1.084	0.907–1.296
Immediate Fam Hx (Yes)	0.306	0.142	4.625	1	0.032	**1.359**	**1.028–1.796**
Depression (Yes)	0.179	0.108	2.748	1	0.097	1.196	0.968–1.478
Constant	-2.324	10.183	160.363	1	0.000	0.98	

Variables with statistical significance are in Bold

disorders are often bidirectional, and not all types of SUDs are associated with PLEs. Although cannabis use and cigarette smoking are strongly correlated, studies have shown that tobacco use is specifically strongly linked with the onset of PLEs (van Gastel et al., 2013).

Clinical Implications of the Study

There are important clinical implications of our study. It is now well established that psychotic symptoms exist on a continuum with schizophrenia at one end and PLEs in healthy individuals at the other end. Since most PLEs in healthy individuals are not associated with distress and do not lead to clinical disorder, there is no justifiable reason in providing preventative intervention for such individuals. However, some groups of PLEs are distressing and may persist and develop into psychotic disorders as well as mood and anxiety disorders. It is therefore important to have early detection and intervention service structures in place for help-seeking individuals. Furthermore, the variability in the literature regarding PLEs emphasizes the need for further cross-cultural research regarding the phenotypic expression of PLEs and their associated variables. Our study demonstrated that PLEs cut across cultures and that the epidemiology in sub-Saharan Africa is similar to that obtained in the high-income countries.

Limitations and Strengths

Several limitations should be considered. These include (a) We used a rating scale to measure PLEs instead of a diagnostic instrument; (b) Our study was cross-sectional, and causation cannot be inferred, and lastly (c) We had evaluated for clinically significant psychotic-like experience (CS-PLE) symptoms which cannot be equated with Clinical High Risk (CHR) directly. However, self-rating scales for PLE have been shown to have a high degree of accuracy (Kelleher & Cannon, 2011). Also, the PQ-B was specifically designed to capture PLEs with distress and has been culturally validated in Nigeria (Okewole et al., 2015b); (b) Our results are also in line with other studies demonstrating the family and environmental risk factors for PLEs. Our study has several strengths. We used a robust sampling method to identify a large sample from a non-clinical population with a wide age range. We assessed a wide range of variables using data collection instruments that are culturally validated. We limited recall bias by assessing for a one-month prevalence of PLE and focused on distressing symptoms.

Conclusion

We found that clinically significant PLEs are relatively common in non-help-seeking Nigerian adults and our results suggest that both genetic and environmental factors play a role. The population significantly at risk include young adults aged 18–24 years old and females. Also, those with a history of mental illness in the immediate family and those with substance use disorders (including cannabis) have a high risk of having clinically significant PLE in this environment. A follow-up study to ascertain the short-term progression of participants with clinically significant PLE from this study in terms of changes in PLE status, the transition to psychosis or other mental health disorders, and contact with mental health services is currently underway.

Credit Authorship's Contribution Statement AOA formulated the research question; AOA, OEO & TA were involved in the design of the study and data collection; AOA, LA, and RE performed the analysis; AOA, LA, and RE wrote the first draft; and all authors approved the final submission.

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Data Availability Statement The data that support the findings of this study are available from the Lagos State Ministry of Health, Nigeria but restrictions apply to the availability of these data, which were used under licence for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of Lagos State Ministry of Health. The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was approved by the Ethics and Research Committee of the Lagos State University Teaching Hospital (LASUTH) with Reference number NHREC/10/06/362.

Consent to Participate Informed consent was obtained from all individual participants included in the study.

Consent to Publish The authors affirm that human research participants provided informed consent for publication of results from this study.

Declaration of Competing Interest This work was supported by the Lagos State Ministry of Health with Grant number LSS001 awarded to the first author, Abiodun O. Adewuya.

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