Functional Diarrhoea in a Nigerian Community: Prevalence, Risk Factors and Associated Quality of Life

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ABSTRACT

Introduction: Diarrhoea, in general, is well investigated but the epidemiology of Functional Diarrhoea (FDr) as a disease entity has not been adequately evaluated globally, and more especially, in the sub-Saharan African population.

Aim: To determine the prevalence and risk factors of FDr, and the associated quality of life in a Nigerian community.

Materials and Methods: The study was a community-based cross-sectional survey involving 515 consenting adults aged 18-70 years. Data collection was done from February to March 2019. Ten participants were excluded because of inappropriately filled questionnaires, thus leaving a total of 505 subjects. The research instrument contained sociodemographic information, the Rome IV Functional Bowel Disorder questionnaire, the Short Form 12, version 2 Health Survey (SF-12v2) questionnaire, the Beck Depression and Anxiety Inventories, the Pittsburgh Sleep Quality Index (PSQI), and the Early Trauma Inventory-Self Report.

Respondents who were positive for FDr were the cases while those who had no FDr were the controls in the data analysis. Independent Student t-test was used to compare means. The odds ratios of prospective risk factors of FDr were calculated with logistic regression. Odds Ratios (OR) >1 and p-value ≤0.05 were considered significant.

Results: The mean age of the participants was 32.7±12.9 years. Six participants {1.2% (95% CI, 0.4%-2.4%)} had FDr with a 1:2 Male/Female ratio. Functional diarrhoea had a statistically significant association with depression (18.0±12.8 vs 8.2±9.5, p-value=0.021) only among the possible risk factors considered. The mean SF-12v2 scale scores, except Vitality, were lower in subjects with FDr than the controls, though only Social Functioning was statistically significant (p-value=0.003).

Conclusion: The prevalence of FDr is low in the present study population. The disease is associated with depression and it impacts the Health-Related Quality of Life (HRQoL) negatively.

Keywords: Chronic diarrhoea, Functional bowel disorder, Functional gastrointestinal disorders, Health-related quality of life

INTRODUCTION

Diarrhoea is considered to be chronic when the duration of onset is up to or more than 4 weeks [1]. Chronic diarrhoea is a fairly common condition in the society, though the precise prevalence is unknown due to the differing diagnostic criteria used to determine its prevalence [1]. According to one estimate, diarrhoea persisting for more than 4 weeks has a prevalence of 3 to 5% in the population [1].

There are numerous studies on diarrhoea, in general, in sub-Saharan Africa but the precise prevalence of chronic diarrhoea in the adult population of the region is not known. Previous studies are related to acute diarrhoea, diarrhoea in children and diarrhoea in patients with acquired immunodeficiency syndrome. Daniyam CA et al., reported prevalence rates of 10% and 12.3%, respectively of adults with loose/watery stools in the urban and rural areas of Jos Plateau, Nigeria, though they did not put a time limit to the symptom [2].

Many people with chronic diarrhoea do not seek medical attention except if their diarrhoea is accompanied by other significant symptoms such as abdominal pain, rectal bleeding, weight loss or faecal incontinence [3]. The diagnostic evaluation of chronic diarrhoea may be complex because a broad range of conditions could present with it. These include infectious conditions, organic causes such as inflammatory bowel disease, malabsorption syndromes, colorectal cancer, and unknown causes [3]. Despite the large number of causative factors of chronic diarrhoea, extensive investigations do not find any cause in a reasonable number of patients, who are said to have FDr [4].

The Rome IV diagnostic criteria define FDr as a Functional Bowel Disorder (FBD) characterised by recurrent passage of loose or watery stools in the absence of a structural or physiological abnormality

detected by routine diagnostic examinations that are considered clinically appropriate [4]. A close differential of FDr is Diarrhoea-predominant Irritable Bowel Syndrome (IBS-D) but IBS-D is usually associated with a predominant abdominal pain. Though abdominal pain and/or bloating could be present in patients with FDr, they are not predominant symptoms [4]. In essence, patients with FDr must not meet the diagnostic criteria for IBS. Recurrent passage of loose or watery stool should be present during the last 3 months and the onset must have occurred at least 6 months before diagnosis [4].

Several causes of diarrhoea need to be ruled out when evaluating FDr. A combination of abdominal pain with intermittent diarrhoea with or without constipation in the absence of an organic aetiology is highly suggestive of IBS. Pseudo-diarrhoea, which consists of frequent passage of solid stools with urgency [5], should be excluded. However, in the absence of an organic aetiology with the exclusion of IBS, the diagnosis of FDr can be reasonably made in persons with chronic diarrhoea.

Unlike IBS which has been extensively studied, especially in the West and Asia-Pacific, the epidemiology of FDr has not been adequately studied [4]. The paucity of data concerning FDr is more acute in sub-Saharan Africa, including Nigeria. A very limited number of studies have addressed the pathophysiology of FDr [6-8]. One of such studies found decreased non-propagating colonic contractions and increased propagating colonic contractions in subjects with FDr [7]. Psychosocial factors have also not received much research attention apart from the finding of accelerated colonic transit inducible by acute stress [8].

No study was found specifically from sub-Saharan Africa during the literature search, even after we have searched with the names of several countries from the region. Hence the present study was

conducted to determine the prevalence and risk factors of FDr with the HRQoL in a Nigerian community. This study is part of a larger study whose protocol has been described in detail elsewhere [9] and a part of the study results is presented here as well.

MATERIALS AND METHODS

The study was a cross-sectional population-based study. The data collection lasted for about 8 weeks, from 2nd February to 29th March 2019. Clearance from the Ethics Review Board of Babcock University, Ilisan-Remo (BUHREC044/19) was obtained. Written informed consent was also obtained from all respondents. There are no FDr studies in Nigeria whose prevalence could be used to determine the sample size. Using as a surrogate, the proportion of participants (13%) who had diarrhoea-predominant IBS in a previous Nigerian community-based study [10] and the Leslie Fischer's formula ($n=Z^2pq/d^2$, with confidence interval set at 95%, p=Proportion, q=1.0-p, normal deviate Z=1.96 and d=0.05), the minimum sample size required for the study was 174. Adjusting for missing or incomplete data entry with an expected response rate of 90% (0.9), increased the sample size to 193. The present study considered 515 subjects to increase its power.

A total of 515 adults, residents of Ilisan-Remo, Ogun State, Southwest Nigeria, were interviewed. The population of the community is slightly above 10,000 people. There are 51 major streets in the community, out of which 10 were initially randomly selected by ballot. Two additional streets were selected to complete the sample size. Adults (18-70 years) living in the households on each of the selected streets, who consented to participate in the study were interviewed by adequately trained research assistants.

Inclusion criteria: FDr was assessed with the Rome IV [6]. The subject needed to have loose or watery stools, without predominant abdominal pain or bothersome bloating, occurring in at least 25% of stools. The criterion must be fulfilled for the last 3 months with symptom onset at least 6 months before diagnosis. Subjects should also not meet the criteria for diarrhoea-predominant IBS. Since symptoms' frequencies are rated from 0 to 100% with an interval of 10 in the Rome IV questionnaire, 30% cut was considered for the present study. Respondents who were positive for FDr were the cases while those who had no FDr were the controls. Subjects with diarrhoea occurring in at least 30% of stools lasting for at least three months who did not meet the other criteria for FDr were also evaluated.

Exclusion criteria: Pregnant women, those with confirmed diabetes mellitus, unintended weight loss, history of abdominal surgery, and rectal bleeding were excluded.

Survey Instrument and Data Collection

The participants completed a questionnaire containing demographic information such as age, gender, educational attainment; lifestyle factors including cigarette smoking, alcohol consumption, coffee intake; the Rome IV Functional Bowel Disorder questionnaire; the Beck Anxiety and Depression Inventories; the Early Trauma Inventory-Self Report; the PSQI; and the Short Form 12, version 2 Health Survey (SF-12v2) questionnaire. For ease of stool form assessment, a copy of the Bristol Stool Scale was shown to the respondents [11].

Psychological factors: Anxiety and depression were assessed with the Beck Anxiety Inventory (BAI) [12] and the Beck Depression Inventory-II (BDI-II) [13], respectively. Bremmer's Early Trauma Inventory Self-report Short Form (ETISR-SF) [14] version was used for assessment of early life trauma exposure, while sleep quality was assessed with the PSQI [15]. These instruments have been adequately described in the published research protocol [9].

Health-related quality of life: The HRQoL of the participants was assessed by the Short Form-12, version 2 (SF-12v2). The SF-12v2 is a generic HRQoL instrument which measures the Physical

Component Summary (PCS12) and the Mental Component Summary (MCS12) of subjects as well as their profile across 8 subscales {Physical Functioning (PF), Role Physical (RP), Bodily Pain (BP) General Health (GH), Vitality (VT), Social Functioning (SF), Role Emotional (RE), Mental Health (MH)} [16,17]. Each of the components is scored on a scale from 0 to 100 with a mean of 50 and a standard deviation of 10, where the higher scores represent better health.

STATISTICAL ANALYSIS

Data were analysed with the IBM-Statistical Package for Social Sciences software (IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp, Chicago, IL. USA). Summaries of continuous variables were presented as mean±SD. The Independent Student t-test was used to compare means where necessary. Categorical variables were expressed as frequencies and percentages. The odds ratios of prospective risk factors of FDr were calculated with logistic regression. Variables with odds ratios (OR) >1 and p-value ≤0.05 were considered significant.

RESULTS

A total of 515 adults aged 18-70 years were included in the study. Ten participants were excluded due to improper filled questionnaires, so leaving 505 respondents. The respondents' mean age was 32.7±12.9 years. There were 260 (51.5%) female subjects while the others were male. The majority of the subjects [448 (88.4%)] had at least secondary education, while the others had primary or no formal education 57 (11.3%) [Table/Fig-1].

FDr was found in 6 participants {1.2% (95% CI, 0.4%-2.4%)}. The mean age of those with FDr was lower than the controls (27.7±7.7 vs 39.8±13.0), though not statistically significant (p-value=0.346) [Table/Fig-1]. The number of participants with diarrhoea occurring in at least 30% of their stools for 3 months who did not fulfil the other criteria for FDr was 59 {11.7% (95% CI, 8.9%-14.3%)}.

Variable	Total	FDr n=6	No FDr n=499	Odds ratio	p-value
Age (years) (Mean±SD)	32.7±12.9	27.7±7.7	39.8±13.0	0.96 (0.88-1.05)	0.346
Gender {n (%)}					
Male	245 (48.5)	2 (33.3)	243 (48.7)	Reference	0.462
Female	260 (51.5)	4 (66.7)	256 (51.3)	1.9 (0.35-10.45)	
Level of education {n (%)}					
Tertiary	250 (49.5)	3 (50.0)	247 (49.5)	Reference	0.902
Secondary	198 (38.2)	2 (33.3)	196 (39.3)	0.84 (0.14-5.07)	0.849
Nil/Primary	57 (11.3)	1 (16.7)	56 (11.2)	1.47 (0.15-14.40)	0.741
Waist circumference	82±14.6	85.6±12.2	82.0±14.7	1.02 (0.97-1.07)	0.549
Cigarette smoking {n (%)}					
No	455 (90.1)	5 (83.3)	450 (90.2)	Reference	0.582
Yes	50 (9.9)	1 (16.7)	49 (9.8)	1.84 (0.21-16.04)	
Alcohol intake {n (%)}					
No	366 (72.5)	5 (83.3)	361 (72.3)	Reference	0.556
Yes	139 (27.5)	1 (16.7)	138 (27.7)	0.56 (0.06 - 4.52)	
Coffee intake {n (%)}					
No	364 (72.1)	3 (50.0)	361 (72.3)	Reference	0.242
Yes	141 (27.9)	3 (50.0)	138 (27.7)	2.62 (0.52-13.12)	
Physical exercise					
No or <once a week	419 (83.0)	5 (83.3)	414 (83.0)	Reference	0.981
≥Once a week	86 (17.0)	1 (16.7)	85 (17.0)	1.03 (0.12-8.90)	
Anxiety (Mean±SD)	8.6±8.2	11.3±10.7	8.5±8.2	1.04 (0.95-1.13)	0.408
Depression (Mean±SD)	8.3±9.6	18.0±12.8	8.2±9.5	1.07 (1.01-1.13)	**0.021**
Early trauma (Mean±SD)	7.1±5.1	6.3±5.1	7.1±5.1	0.97 (0.82-1.14)	0.697
Sleep quality (Mean±SD)	4.5±3.0	4.5±1.9	4.5±3.0	0.96 (0.73-1.27)	0.765

[Table/Fig-1]: Odds ratios of possible risk factors for FDr (n =505).
FDr: Functional diarrhoea; SD: Standard deviation; OR>1, p-value<0.05 was considered significant

The mean depression score of participants with FDr was higher than that of the controls with statistical significance (18.0±12.8 vs 8.2±9.5, p-value=0.021). There was no significant difference between the mean ETISR-SF and PSQI scores of participants with FDr and the controls [Table/Fig-1].

The mean SF-12v2 scale scores, except for vitality, were lower in subjects with FDr than the controls though only social functioning was statistically significant (p-value=0.003) [Table/Fig-2].

Variables	Total	FDr n=6	No FDr n=499	p-value
Physical functioning	72.9±32.1	70.8±24.6	72.9±32.2	0.876
Role physical	74.0±29.9	56.3±32.4	74.3±29.9	0.143
Bodily pain	75.7±24.9	50.0±38.7	76.1±24.5	0.161
General health	84.8±15.7	81.7±18.1	84.9±15.7	0.622
Vitality	58.0±35.4	66.7±25.8	57.9±35.5	0.548
Mental functioning				
Social functioning	69.7±30.1	33.3±20.4	70.1±30.0	**0.003**
Role emotional	74.9±29.5	58.3±24.6	75.1±29.5	0.168
Mental health	64.5±19.4	64.5±19.5	68.8±15.3	0.599
PCS	50.2±7.7	45.1±7.7	50.6±7.5	0.102
MCS	46.2±8.9	42.9±4.0	46.3±8.9	0.098

[Table/Fig-2]: Mean scores of SF-12v2 scales in subjects with FDr and controls (n=505).
FDr: Functional diarrhoea; PCS: Physical component summary; MCS: Mental component summary; p-value <0.05 was considered significant

DISCUSSION

Functional diarrhoea has received little attention by researchers globally [3] and this is more severe in Africa. Authors could not found any data to compare the finding in Nigeria or other sub-Saharan African countries. International comparison of the prevalence of FDr is a bit difficult because different studies utilised varying diagnostic criteria [Table/Fig-3]. It has been shown that the Rome IV criteria have higher prevalence rates than the Rome III, largely because of the reduction of the cut-off of diarrhoea frequency from 75% to 25% [18].

Region/Country	Study/Reference	Year published	Diagnostic criteria	Prevalence (%)
Europe/America				
Canada	Thompson WG et al., [19]	2002	Rome II	8.5
USA	Palsson OS et al., [18]	2020	Rome IV	4.9
Canada	Palsson OS et al., [18]	2020	Rome IV	5.6
UK	Palsson OS et al., [18]	2020	Rome IV	3.8
Latin America				
Mexico	Schmulson M et al., [20]	2006	Rome II	3.4
Asia				
Taiwan	Chang FY et al., [21]	2012	Rome III	2.2
China	Zhao YF et al., [22]	2012	Rome II	1.5
South Korea	Jeong JJ et al., [23]	2008	Rome II	0.8
Iran	Roshandel D et al., [24]	2006	Rome II	0.7
Iran	Sorouri M et al., [25]	2010	Rome III	0.2
Africa				
Nigeria	Present study	2020	Rome IV	1.2

[Table/Fig-3]: Prevalence of functional diarrhea by region and country [18-25].

Present study obtained a prevalence of 1.2% using the Rome IV criteria. Though this prevalence can be said to be low, there is a moderate prevalence of chronic diarrhoea in the same population

(11.7%). In general, studies in the Western populations have shown higher prevalence rates compared to those conducted in the Asian populations [Table/Fig-3] [18-25]. For example, a population-based study that utilised the Rome II criteria in Canada [19] and another that utilised the Rome IV criteria in the USA [18] had prevalence rates of 8.5% and 4.9%, respectively while studies conducted in China [22] and South Korea [23] with the Rome II criteria produced prevalence rates of 1.5% and 0.8%, respectively. From the foregoing, it can be seen that the prevalence rate obtained in this study is comparable to those obtained in studies from Asia.

Few data are available on the risk factors of FDr [4]. Most of the available studies did not investigate the risk factors of FDr as a disease entity. Among all the possible risk factors examined in this study, only depression was found to be positively associated. It is uncertain whether this association implies causality since a person with FDr could develop depression while it is also possible for depression to induce FDr. A study from China [22] found FDr to be positively associated with increasing age and body weight but Authors did not find such association in the present study. Similar to the Chinese study [22], we found no significant association between FDr and other lifestyle factors such as cigarette smoking, alcohol consumption, and regularity of physical exercise.

Chronic diarrhoea has been noted to be associated with an increased rate of work absenteeism, physician visits and high socioeconomic burden [26] but few studies have evaluated the impact of FDr as a separate disease entity on the HRQoF in the general population. Nevertheless, Palsson OS et al., and Zhao YF et al., have separately reported that FDr negatively impacts the HRQoF of the sufferers [18,22]. In the present study, it was observed that persons with FDr generally had lower mean scores on the SF12v2 scales, though only social functioning was statistically significant. It is possible that social functioning was the most impacted among the variables because having to visit the toilet more often would constitute undue interruption to their social activities.

The strength of this study lies in the fact that it is a community-based study whose findings are representative of the characteristics of the disease in the general population. Since it seems to be the first of its kind in the Nigerian population, the findings would also serve as a reference for future related studies.

Limitation(s)

The major limitation of this study lies in the fact that the data collection instrument relies majorly on recall of bowel habits and several of the psychosocial factors considered and this may have affected the findings of this study. Nevertheless, Manning AP et al., observed that there is a close correlation between recalled and documented histories of bowel habits in more than 80% of cases [27]. Secondly, the findings may not be representative of the paediatric and adolescent population of the community because they were excluded from the study. Thirdly, since we considered only one community due to resource constraints, the findings may not be a fair representation of the epidemiological characteristics of FDr in every part of Nigeria. This is because functional gastrointestinal disorders do exhibit a wide variation in prevalence in communities [4,28].

CONCLUSION(S)

The present study shows that there is a low prevalence of FDr in the community, though chronic diarrhoea is moderately prevalent. In addition to its negative impact on HRQoF, Authors also observed that FDr has a significant association with depression. These observations indicate that physicians who care for patients with FDr need to pay a close attention to their mental health and quality of life to obtain the best care outcomes. Due to the scarcity of data on the disease, further studies are desirable to clarify its epidemiology worldwide, in general, and in the sub-Saharan African population in particular.

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