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Tele-intervention for adults with tinnitus in Ghana, a low- and middle-income country: a feasibility study

Joseph Omane Boateng^{1,2*}, Maggi Soer¹ and Leigh Biagio de Jager¹

Abstract

Background Tinnitus may be associated with anxiety and depression which can affect quality of life. In low- and middle-income countries like Ghana, a shortage of specialized clinicians suggests online interventions could alleviate clinician caseloads, but the feasibility of online intervention is yet to be explored. This study assessed the feasibility of providing tele-intervention in the form of online educational counselling (OEC) for adults with tinnitus in Ghana.

Methods This single-arm trial included 53 Ghanaian adults (female = 21, median age = 34 years) with significant tinnitus severity, internet access, email, and English literacy. Standardized questionnaires were used to assess tinnitus severity, anxiety, and depression levels pre- and post-intervention. Online educational counselling was provided using a free downloadable tinnitus self-help resource over three weeks. Pre- and post-intervention scores were compared and participant perceptions were recorded.

Results Significant reductions in tinnitus severity, anxiety, and depression levels occurred post-intervention. Over half (54.7%) of the participants reported significant reductions in tinnitus severity post-intervention. Bivariate comparisons showed the reduction was associated with baseline tinnitus severity and depression level but not with sex ($p=0.400$), hearing status ($p=0.530$), or anxiety levels ($p=0.058$). Participants demonstrated high adherence (93%) and provided positive feedback on the tele-intervention.

Conclusion Online educational counselling for tinnitus is feasible in Ghana based on adherence and feedback. These findings support integrating OEC into tinnitus care in low-resource settings as an initial, scalable option or within a multi-faceted program.

Introduction

Tinnitus is a term used to describe the perception of sound in the ear or head without an external source, which affects about 5 to 43% of the world's population [1]. The substantial differences in tinnitus prevalence rates across studies can be attributed to variations in how

tinnitus is defined and the diverse characteristics of study participants. Tinnitus is usually common among people with any form of hearing loss and other ear disorders such as otitis media and otosclerosis [2]. Other conditions that have been identified as risk factors for tinnitus include hypertension, diabetes, noise exposure and ototoxicity. Tinnitus can be described as objective or subjective. Objective tinnitus originates from other organs in the body, such as blood vessels, and can be heard by someone other than the sufferer, whereas subjective tinnitus, the most common type, can only be heard by the sufferer [3]. According to Noreña [4], subjective tinnitus signals are generated in the central auditory system in response to reduced sensitivity to sound which may be

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due to peripheral cochlear damage. Although tinnitus is considered a symptom rather than a disease condition, it can be debilitating for about 6% of people with tinnitus, because it is usually associated with anxiety, stress, depression, and sleep deprivation, which affect the quality of life [5]. In extreme cases, suicidal ideation and behaviors have been reported among individuals who experience tinnitus [6].

Currently, there is no medication for treating tinnitus, even though medications might be prescribed to treat suspected underlying conditions such as ear infections, and comorbidities of tinnitus, such as depression [7]. Amplification is also provided to improve hearing acuity of individuals with hearing impairment as well, which in turn reduces tinnitus perception due to the masking effect of louder environmental sounds [8]. The psychological distress which may be associated with the onset of tinnitus, has been found to increase tinnitus severity and serve as a mediator of chronic tinnitus [9]. Therefore, psychological interventions are recommended for tinnitus management [2, 10]. An example of such an intervention is educational counselling, which involves the provision of information on tinnitus (causes, prognosis, and comorbidities), available interventions, and coping strategies and techniques [11]. Liu et al. [12] observed a reduction in tinnitus severity and, tinnitus-related distress among 159 adults with tinnitus in China, after educational counselling was provided. In a survey conducted among adults with tinnitus in the United Kingdom, educational counselling was identified as one of the most effective components of tinnitus management [13].

In low- and middle-income countries (LMICs), there are not enough clinicians such as ear, nose, and throat specialists, audiologists and clinical psychologists, relative to the number of individuals with tinnitus who require management. [14]. Therefore, internet-based health service delivery presents potential alternatives [15]. Presently, several online interventions and self-help resources are available to support individuals with diverse health conditions, including tinnitus [16]. Studies have investigated the effect of delivering various tele-interventions, including educational counselling through the use of online text materials, voice notes, video recordings, video-conferencing, and smartphone applications [17–19]. Systematic review and meta-analysis studies observed that both conventional in-person and online approaches equally reduced the severity of tinnitus and tinnitus-related distress [20–23].

Currently, audiological services are available in only six out of the 16 regions of Ghana, and the number of audiologists to population ratio is about 1:879,789 [24]. This implies that individuals with tinnitus are highly underserved and may have to travel long distances to access

healthcare services. With the significant rise in global internet access and usage, tele-intervention has proven to be effective in improving both accessibility and compliance with healthcare services in such cases [20]. In Ghana, although internet usage has increased from 8 to 69% between 2010 and 2021, the use of such novel approaches for tinnitus management is yet to be explored [25]. Consequently, the current study aimed to determine the feasibility of delivering online educational counselling (OEC) to Ghanaian adults with tinnitus using a freely accessible online self-help resource.

Methods

Study design

The study employed a single-arm trial design due to its efficiency and cost-effectiveness, for obtaining preliminary data on a new intervention before a randomized controlled trial is conducted [26]. While this design is ideal for identifying bottlenecks in the delivery of an intervention, it is not capable of determining the efficacy of the intervention due to the absence of a control group [26].

Ethical approval

Ethical clearance was obtained from the Research Ethics Committee of the Faculty of Humanities at the University of Pretoria (reference number HUM 002/1220). Each participant provided written informed consent prior to data collection.

Recruitment of participants

Purposive sampling technique was used to recruit participants for this study. All operational audiology centres nationwide were invited to participate as sites for the study, of which four centres responded affirmatively. The participants were first-time attendants at four audiology centres located in two out of the 16 regions of Ghana between January and December 2022, with the complaint of experiencing tinnitus in either one or both ears for at least one month. The intervention was delivered online via email and in English, therefore the participants were selected using the following criteria; (a) Ghanaian adult (18 years or older); (b) complaint of tinnitus [Tinnitus Functional Index (TFI) score > 31]; (c) able to read English; and (d) have an active email address and access to internet. Participants were not excluded based on their hearing sensitivity to avoid skewing the results toward a specific tinnitus subgroup and to enable subgroup analysis (normal hearing vs. hearing loss). Individuals presenting with pulsatile tinnitus or receiving alternative interventions for tinnitus and hearing loss, such as the use of hearing aids and sound therapy, were excluded from the study. The exclusion was due to the vascular

origin of pulsatile tinnitus, which may indicate serious underlying pathology. Furthermore, the presence of other interventions complicates the attribution of outcome changes to the study intervention.

Of the 311 adults with tinnitus who reported to the four audiology centres during the period of data collection, 185 (59.6%) had significant tinnitus handicap (TFI score >31) and were invited to participate in the study. Only 66 (35.7%) met all the remaining inclusion criteria (access to internet, active email addresses, and being able to read English) for receiving online intervention. Nine adults declined to participate in the study resulting in an overall uptake of 30.8% (n=57). In total, data from 53 participants were included in the analysis, as four participants did not respond to the post-intervention questionnaires despite multiple reminders. According to Sim and Lewis [27], a sample size of at least 50 is adequate for feasibility studies. Figure 1 presents the flowchart of participant recruitment.

Materials and procedure for data collection

Three validated self-administered questionnaires were used for data collection. The questionnaires incorporated the TFI to measure tinnitus severity, General Anxiety Disorder (GAD) – 7 to assess anxiety levels, and the Patient Health Questionnaire (PHQ) – 9 to assess the level of depression. The validity and reliability of the three questionnaires have been established by several

authors [28–30]. The TFI comprises 25 questions that assesses eight (intrusiveness, sense of control, cognitive, sleep, auditory, relaxation, quality of life, and emotional) domains of tinnitus handicap. The categories of tinnitus severity based on total TFI scores were as follows: 0 to 17%—"slight or no tinnitus," 18 to 31%—"mild tinnitus," 32 to 53%—"moderate tinnitus", 54 to 72%—"severe tinnitus," and 73 to 100%—"very severe tinnitus." The GAD-7 questionnaire comprises seven questions that assess nervousness, worriedness, relaxation difficulties, restlessness, irritability and fear. The total GAD-7 score was classified as follows: minimal anxiety (0–4), mild anxiety (5–9), moderate anxiety (10–14), and severe anxiety (15–21). The PHQ-9 questionnaire contains nine questions that assess loss of interest, depressed mood, sleep disturbances, fatigue, appetite changes, worthlessness, concentration difficulties, psychomotor agitation or retardation, and suicidal ideation. The total PHQ-9 scores were classified as follows: no depression (0–4), mild depression (5–9), moderate depression (10–14), moderately severe depression (15–19), and severe depression (20–27).

Pre-intervention assessment

The pre-intervention questionnaires comprised questions pertaining to socio-demographic variables, such as sex, age, and educational level, as well as the TFI, GAD-7, and PHQ-9 questionnaires to assess tinnitus severity, anxiety, and depression levels, respectively. The

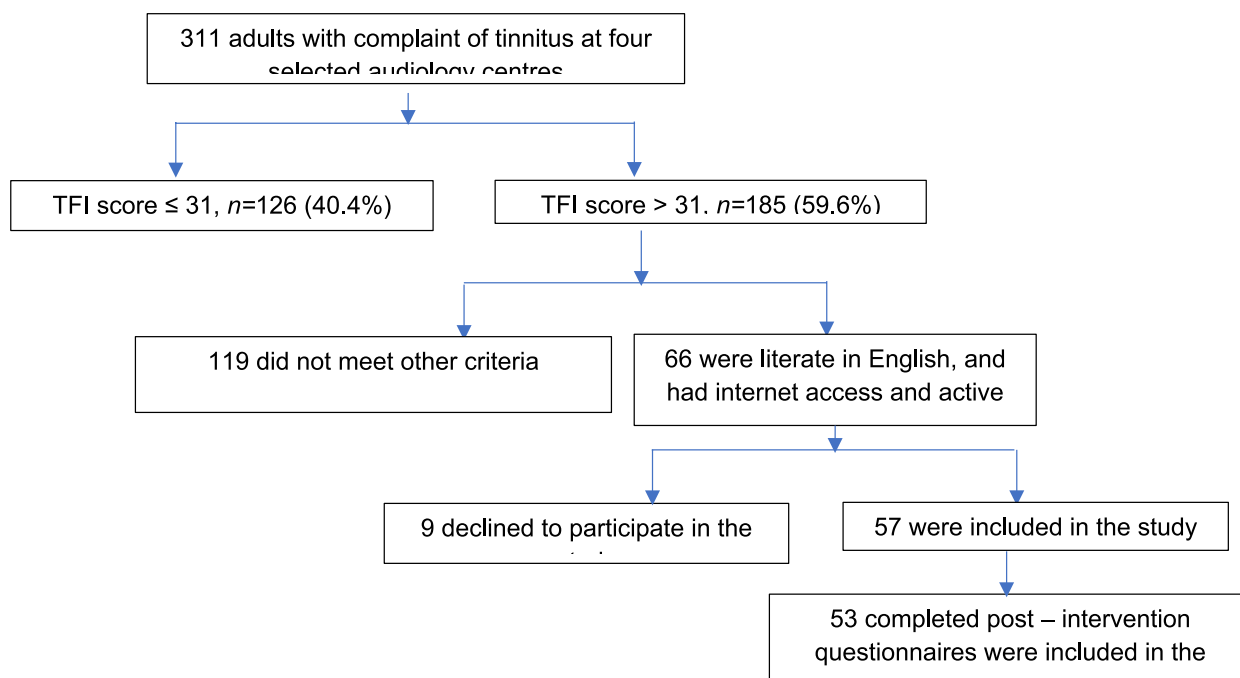


Fig. 1 Flow chart for recruitment of participants

pre-intervention questionnaire was administered during the participants' first visit to any of the four audiology centres. The hearing acuity of the participants was ascertained by behavioural pure tone audiometry in a sound booth (ambient noise level ≤ 35 dBA) after the pre-intervention questionnaire was administered. Air and bone conduction thresholds were obtained using a modified Hughson–Westlake method across 250 to 8000 Hz and 500 to 4000 Hz, respectively [31]. A pure tone average (500, 1000, 2000, and 4000 Hz) of 25 dBHL or less was categorized as normal hearing, whereas a pure tone average exceeding 25 dBHL for each ear was classified as unilateral hearing loss when it occurred in one ear, or bilateral hearing loss when it occurred in both ears [31].

Intervention

The Tinnitus First Aid Kit (TFAK), developed by the Ida Institute and Tinnitus UK (formerly known as the British Tinnitus Association), was a freely accessible online self-help resource for tinnitus management available during the study period. It provided information on the prevalence and possible causes of tinnitus and coping strategies, such as basic relaxation techniques and sound therapy, which are fundamental for the management of tinnitus. Furthermore, it suggested strategies for improving both physical and mental health. The TFAK content is comparable to the materials used for educational counselling by other authors, who found that educational counselling was an effective intervention for individuals with severe tinnitus [17–19]. At the time of manuscript preparation, the kit was discontinued. However, the information it contained has been updated and rebranded as 'Take on tinnitus' which is accessible on the Tinnitus UK website [32].

The various sections of the TFAK web pages were sent via email to the participants to work through over a period of three weeks. This method was adopted to create a more personalized approach, ensure timely access to information within the study's allocated timeframe, and ultimately enhance adherence.

Week one

What is tinnitus?

This section provides information on the prevalence and cause of tinnitus. It informs the reader of the availability of evidence-based techniques that can help and provides websites that can offer further accurate information on tinnitus.

Week two

What should I do? (First steps)

This section reassures the participant and informs the participant of certain actions that can worsen the

condition. It also encouraged participants to seek help and more information on tinnitus. Finally, it provides information on basic sound therapy and relaxation techniques that can help reduce stress associated with tinnitus.

Week three

Next steps

The final section elaborates on the importance of treating any identified hearing loss, and the use of sound enrichment therapy and healthy living to manage tinnitus. The participants were given the opportunity to contact the principal author via email or telephone for further explanation of the information provided by the TFAK. Nevertheless, none of the participants utilized this opportunity.

Post-intervention assessment

The participants were served with the post-intervention questionnaire which comprised of TFI, GAD-7, and PHQ-9 questionnaires, a week after receiving the intervention. There was an additional section which required participants to rate the appropriateness and satisfaction with the intervention provided using Likert scales. The post-intervention assessment questionnaires were sent via email to participants, a week after receiving the OEC.

Statistical analysis

Responses from the questionnaires were analyzed using SPSS (version 25). Descriptive statistics were summarized using frequencies, means or medians, and standard deviations. The Shapiro–Wilk test indicated that the overall TFI scores of the participants were normally distributed ($p > 0.05$) whereas the TFI subscale, GAD-7 and PHQ-9 scores were not normally distributed ($p < 0.05$). Hence, paired t-test was used to compare the mean pre- and post-interventions TFI scores, while the Wilcoxon signed-rank test was used to compare the TFI subscale, GAD-7 and PHQ-9 scores of the participants, at a 95% significance level. As this was a feasibility study, the p -values were not corrected. However, effect size (r) was calculated to determine the extent of the difference between the pre- and post-intervention TFI subscale scores [33]. Effect size was categorized according to Cohen's criteria; $r < 0.3$ (small), $0.3 \leq r < 0.5$ (moderate), and $r \geq 0.5$ (large).

A reduction in overall TFI score by 13 points after OEC was considered a significant change in tinnitus severity as postulated by developers of the TFI questionnaire [30]. Fisher's exact and chi-square tests were used to determine factors associated with experiencing significant changes in tinnitus severity after OEC. Statistical significance was at $p < 0.05$.

Results

Recruitment, acceptability and adherence

Less than half of the potentially eligible participants ($n=66$, 35.7%) met the inclusion criteria required for participation in the online intervention, namely access to the Internet, possession of an active email address, and the ability to read English. Of the 66 eligible individuals, nine declined requests for them to participate in the study, resulting in an uptake rate of 30.8% ($n=57$). Among the 57 participants who enrolled in the study, four participants (7.0%) did not complete the post-intervention questionnaires despite multiple reminders.

Characteristics of participants

The demographics of the participants are presented in Table 1.

Twenty-one participants (39.1%) were female with ages ranging from 22 to 59 years (median=34 years). The majority ($n=44$, 83%) of the participants had obtained tertiary or university-level education. Nearly half ($n=24$, 45.3%) of the participants had mostly sensorineural hearing loss with one participant presenting with mixed hearing loss. The degree of hearing loss ranged from mild

to moderate and affected either one ($n=10$, 18.9%) or both ears ($n=14$, 26.4%). Prior to intervention, the participants described tinnitus as either moderate ($n=25$, 47.2%), severe ($n=25$, 47.2%) or very severe tinnitus ($n=3$, 5.6%), based on TFI scores (Table 1). The majority of the participants reported mild to severe levels of anxiety ($n=40$, 75.5%) and depression ($n=32$, 60.4%) based on GAD-7 and PHQ-9 scores, respectively.

Changes in tinnitus severity

The TFI scores of the participants were compared before and after the intervention. There was a reduction between the pre-intervention ($M=55.3$, $SD=13.7$) and post-intervention TFI scores ($M=41.6$, $SD=11.9$). A paired t -test found a mean difference of 13.7, 95% CI [10.8, 16.6], which was statistically significant ($t_{(52)}=9.59$, $p<0.001$). Table 2 presents the median scores of the different subscales, before and after OEC.

From Table 2, significant reductions ($p<0.05$) were recorded between the pre- and post-intervention scores across all subscales of the TFI, with moderate to large effect size ($r=0.41$ to 0.86) with the exception of the auditory subscale which recorded a low effect size ($r=0.23$).

Table 1 Demographic information and pre-intervention TFI, GAD-7 and PHQ-9 scores of participants ($n=53$)

Variable		Frequency ($n=53$)	Percentage (%)
Sex	Male	32	60.4
	Female	21	39.6
Age (years) Median = 34	21–30	20	37.7
	31–40	16	30.2
	41–50	13	24.5
	Above 50	4	7.6
Educational level	Primary	0	0
	Secondary	9	17.0
	Tertiary	44	83.0
Hearing status	Normal	29	54.7
	Unilateral HL	10	18.9
	Bilateral HL	14	26.4
Pre – intervention TFI score	Moderate tinnitus	25	47.2
	Severe tinnitus	25	47.2
	Very severe tinnitus	3	5.6
Pre – intervention GAD-7 score	No/minimal	13	24.5
	Mild	16	30.2
	Moderate	11	20.8
	Severe	13	24.5
Pre – intervention PHQ-9 score	Minimal	21	39.6
	Mild	15	28.3
	Moderate	9	17.1
	Moderately severe	4	7.5
	Severe	4	7.5

TFI Tinnitus Functional Index, HL Hearing loss, GAD General Anxiety Disorder, PHQ Patient Health Questionnaire

Table 2 Pre- and post-intervention Tinnitus Functional Index scores (n = 53)

TFI subscale	Period	Median	Test statistic (Z)	p-value	Effect size (r)
Intrusiveness	Pre-intervention	76.7	-6.28	< 0.001*	0.86
	Post-intervention	46.7			
Sense of control	Pre-intervention	63.3	-5.87	< 0.001*	0.81
	Post-intervention	43.3			
Cognition	Pre-intervention	50.0	-3.78	< 0.001*	0.52
	Post-intervention	33.3			
Sleep	Pre-intervention	40.0	-2.98	0.003*	0.41
	Post-intervention	30.0			
Auditory	Pre-intervention	50.0	-2.02	0.043*	0.23
	Post-intervention	43.3			
Relaxation	Pre-intervention	50.0	-4.39	< 0.001*	0.60
	Post-intervention	30.0			
Quality of life	Pre-intervention	57.5	-5.07	< 0.001*	0.69
	Post-intervention	40.0			
Emotional	Pre-intervention	60.0	-6.16	< 0.001*	0.85
	Post-intervention	33.3			

TFI Tinnitus Functional Index, * = significant

Figure 2 presents the changes in tinnitus severity experienced by the participants based on TFI levels.

From Fig. 2, all the participants who described tinnitus as very severe (n = 3, 5.7%), reported a reduction from ‘very severe’ to ‘severe’ tinnitus after the OEC. Following the intervention, 12 participants (22.6%) who initially reported experiencing either moderate or severe tinnitus, recorded a reduction in tinnitus severity to a mild level.

However, 19 (35.8%) of the participants who initially reported experiencing either moderate or severe tinnitus prior, did not experience any change in tinnitus severity following the intervention.

Change in anxiety and depression levels

Figure 3 illustrates statistically significant reductions (p < 0.05) in the mean pre- compared to post intervention

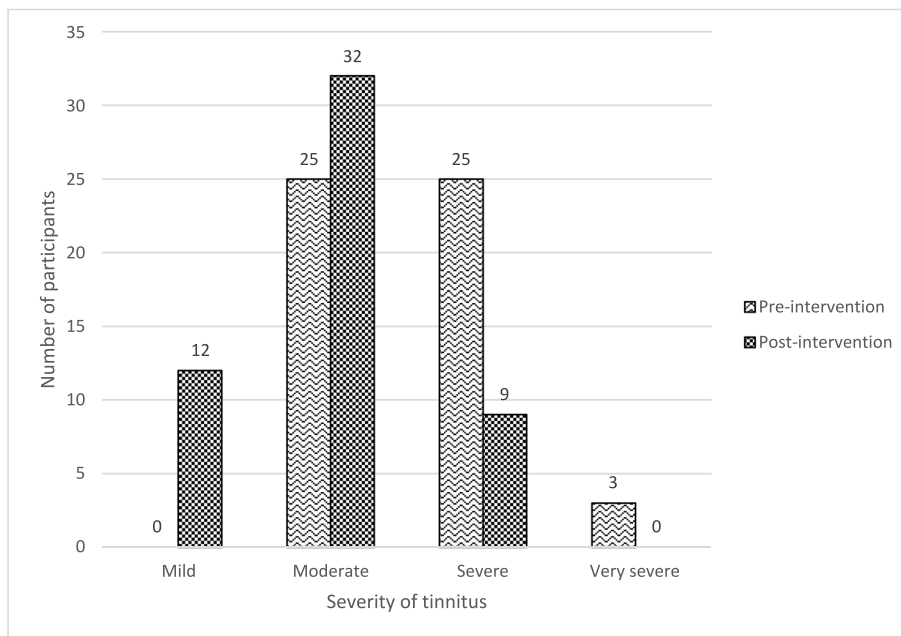


Fig. 2 Pre- and post-intervention Tinnitus Functional Index levels

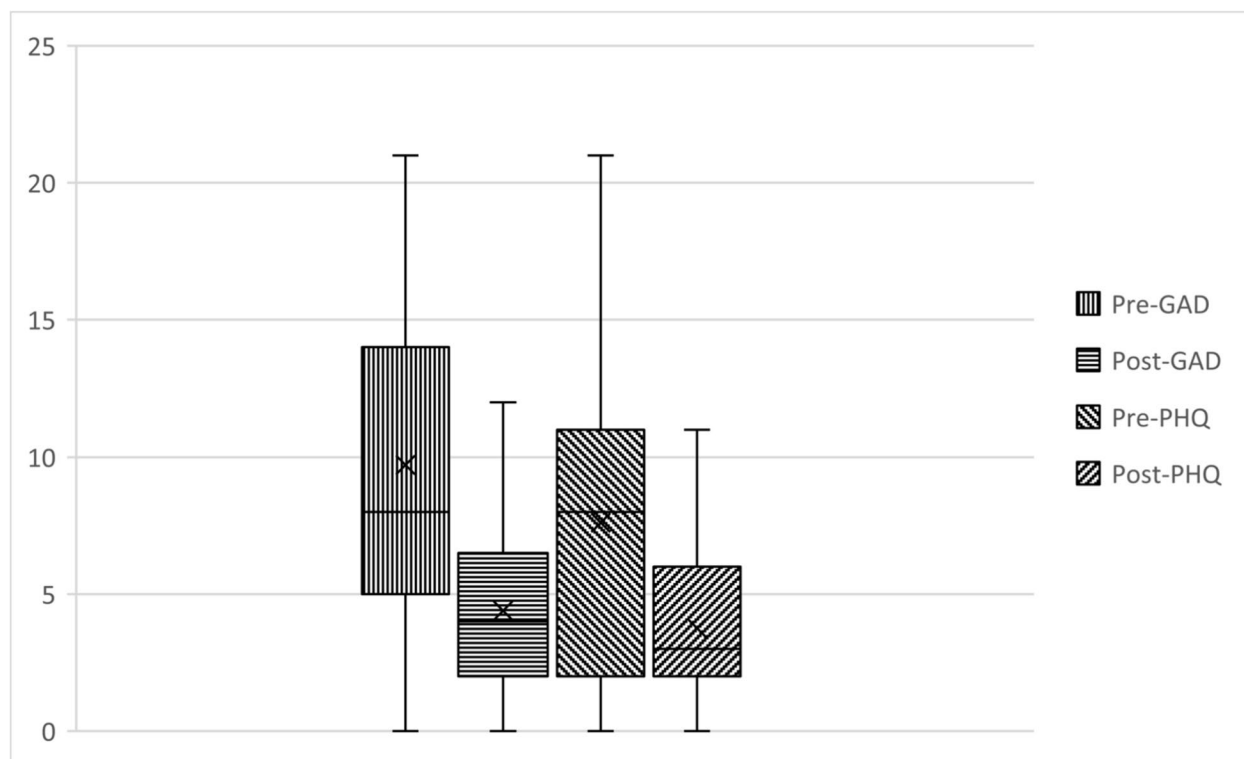


Fig. 3 Pre and post GAD-7 and PHQ-9 scores

GAD-7 and PHQ-9 scores from 9.7 ($SD=6.1$) to 4.4 ($SD=3.05$), and from 7.6 ($SD=6.1$) to 3.9 ($SD=2.9$), respectively. The findings suggest that the participants' levels of anxiety and depression were significantly reduced following the intervention.

Factors related to reduction in tinnitus severity

Table 3 presents the factors associated with a significant reduction in tinnitus severity among the participants.

The study observed that significant reduction in tinnitus severity following the intervention correlated positively ($p < 0.05$) with only the initial TFI and GAD-7 levels among other demographic characteristics (Table 3).

Participants' review of online educational counselling

The participants were asked to evaluate the intervention that was provided. Table 4 presents their responses.

All the participants deemed the OEC to be suitable for tinnitus management, at least to some extent, and would recommend educational counselling to other individuals with tinnitus. Overall, the majority ($n=38$, 71.7%) of the participants rated the intervention provided as either good or very good (Table 4).

Discussion

The current study explored the feasibility of offering online educational counselling to adults with tinnitus in Ghana. Although the uptake of the OEC was low, adherence and satisfaction levels were high. In addition, a significant reduction in tinnitus severity, as well as anxiety and depression levels, was recorded among the participants after undergoing three weeks of OEC, which corroborates the findings of other authors in the literature.

In the present study, only 66 (35.7%) of the 185 adults experiencing significant tinnitus were able to meet the requirement to receive the OEC. This limited participation was primarily attributed to lack of access to devices such as smartphones and computers, low digital literacy, internet unavailability, and English illiteracy. These factors have been recognized by other researchers as barriers to the integration of tele-intervention into the healthcare delivery systems of LMICs such as Ghana [34]. To address these challenges, alternative modalities for delivering educational counselling, such as the utilization of brochures and audio recordings of educational material in various local languages, may be explored.

Of the remaining 57 participants, four did not complete the post-intervention questionnaire, resulting in a 93% adherence rate. Generally, high adherence rates (82 to 95%) have been recorded among individuals with

Table 3 Factors associated with significant reduction in tinnitus severity ($n = 53$)

Variable		Change in TFI scores (n, %)		Test statistic	p-value
		Significant	Not significant		
Sex	Male	19 (35.8)	13 (24.5)	0.7 ^a	0.400
	Female	10 (18.9)	11 (20.8)		
Hearing status	Normal	17 (32.2)	12 (22.6)	0.4 ^a	0.530
	Hearing loss	12 (22.6)	12 (22.6)		
Pre – intervention TFI level	Moderate	7 (13.2)	18 (33.9)	13.8 ^b	0.001*
	Severe	19 (35.9)	6 (11.3)		
	Very severe	3 (5.7)	0 (0)		
Pre – intervention GAD-7 level	No/minimal	4 (7.5)	9 (16.9)	7.2 ^b	0.058
	Mild	7 (13.2)	9 (16.9)		
	Moderate	8 (15.2)	3 (5.7)		
	Severe	10 (18.9)	3 (5.7)		
Pre – intervention PHQ-9 level	Minimal	6 (11.3)	15 (28.3)	10.6 ^b	0.022*
	Mild	10 (18.9)	5 (9.4)		
	Moderate	6 (11.3)	3 (5.7)		
	Moderately severe	3 (5.7)	1 (1.9)		
	Severe	4 (7.5)	0 (0)		

^a Chi square^b Fisher's exact, *TFI* Tinnitus functional index, *GAD* General Anxiety Disorders, *PHQ* Patient Health Questionnaire, * = significant**Table 4** Participants' evaluation of online educational counselling ($n = 53$)

Statement	Responses	Frequency ($n = 53$)	Percentage (%)
Do you feel you received the intervention that was right for you?	No, not at all	0	0
	Yes, to some extent	39	73.6
	Yes, for the most part	0	0
	Yes, completely	14	26.4
Would you recommend this intervention to others with your illness?	No	0	0
	Maybe	0	0
	Yes	53	100
How do you rate this intervention overall?	Poor	0	0
	Fair	15	28.3
	Good	27	50.9
	Very good	11	20.8
	Excellent	0	0

tinnitus receiving online psychological management, such as educational counselling in the literature [16, 20, 21]. The limited duration (three weeks) of the intervention in the present study may have contributed to the high adherence rate observed, and further suggests that the provision of OEC could be feasible among adults with tinnitus in Ghana.

A comparison of the overall TFI score and TFI sub-scale scores of the total participant group before and after three weeks of OEC, showed a statistically significant reduction in tinnitus severity. Of the 53 participants,

29 (55.7%) recorded a significant reduction (by at least 13 points) in the overall TFI score after receiving educational counselling [30]. Similarly, Liu et al. [12] observed a significant reduction in tinnitus severity among 60.4% of adults with tinnitus in China who received educational counselling. In a randomized control trial among adults with tinnitus in the Republic of Korea, Lee et al. [17] reported significant reduction in the domains of tinnitus handicap after two weeks of OEC. A systematic review by Xang et al. [22] found that educational counselling delivered either face-to-face, online, or via educational

leaflets resulted in a reduction in tinnitus severity similar to other known interventions for tinnitus such as Cognitive Behavioural Therapy and sound therapy. Therefore, providing educational counselling to individuals with tinnitus is considered effective in the reduction tinnitus severity and highly recommended [2, 10].

In the present study, not only was tinnitus severity positively impacted, but the provision of OEC led to statistically significant reductions in GAD-7 and PHQ-9 scores among the participants, indicating a reduction in anxiety and depression levels. Other authors have reported similar effects of educational counselling on anxiety and depression, with a resultant reciprocal impact on overall perceived tinnitus severity among adults with tinnitus [12, 22]. Educational counselling can be considered a form of psychological intervention; hence, its impact would likely be felt on tinnitus-related distress such as anxiety and depression, and would be an important component of tinnitus management to address associated emotional disorders.

The study further revealed that a significant decrease in the TFI score or tinnitus severity following OEC, was associated with pre-intervention tinnitus severity score and depression level. The correlation between tinnitus severity, anxiety and depression levels is well established in the literature, with most findings suggesting that anxiety and depression contribute to the development of and/or sustain tinnitus [9, 35]. Thus, the assessment and management of comorbidities, such as anxiety and depression, are considered important aspects of tinnitus management [10]. Likewise, other researchers identified high baseline tinnitus severity as a strong predictor of significant reduction in tinnitus severity particularly following psychological management in the form of educational counselling [18, 36]. This phenomenon can be attributed to the fact that individuals with high tinnitus severity and distress levels possess greater potential for improvement, when compared to those with minimal tinnitus severity and distress levels. Previous studies found factors such as age, sex, hearing loss, and level of anxiety, to be associated with a significant reduction in tinnitus severity after management [37, 38]. However, these factors were not associated with a statistically significant reduction in tinnitus severity in the current study. This outcome may be attributed to variations in participant characteristics and the inclusion of additional interventions, such as sound therapy alongside educational counselling, in the other studies.

Overall, the participants provided a highly positive review of the intervention offered. All participants concurred that OEC was appropriate for management of tinnitus and would recommend it to others. The majority (71.7%) of the participants evaluated the

intervention as good or very good. In a previous study conducted by Husain et al. [39] the majority (62%) of participants who reported high levels of satisfaction with tinnitus management indicated that increased education or access to information about tinnitus significantly influenced the outcome of tinnitus management. The responses of the participants in the current study suggest that OEC can effectively be incorporated into the management of tinnitus in Ghana, particularly for individuals with access to internet.

Strengths and limitations

This study offers new insights into the utilization of tele-interventions for tinnitus management within the Ghanaian population. However, the efficacy of OEC could not be established because there was no control group in the study. In addition, there is a likelihood of participant selection bias toward more educated and urban participants, as only 35.7% of eligible individuals met the inclusion criteria (mainly due to English literacy and internet access). This can affect the generalizability of the results.

Conclusion

This study demonstrated that a brief OEC is a feasible, acceptable, and effective intervention for adults with tinnitus in Ghana. Participants showed a significant reduction in tinnitus severity, and concurrent anxiety and depression levels. Greater baseline tinnitus severity predicted larger improvements in tinnitus severity. The provision of OEC as an intervention for tinnitus appeared to be feasible and effective among the participants, and can be integrated into tinnitus care in low resource settings either as an initial, scalable first line option or as part of a multi-faceted intervention program. Larger randomized trials with longer follow up are warranted to confirm efficacy and define optimal delivery strategies for broader population uptake.

Disclosure statements

The authors declare no conflict of interest regarding the publication of this article.

Authors' contributions

JOB: Conceptualization, data collection and analysis, interpretation of results, writing of manuscript. MS: Conceptualization, interpretation of results, review and editing of manuscript. LBDJ: Conceptualization, interpretation of results, review and editing of manuscript.

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Data availability

Available upon request.

Declarations

Ethics approval and consent to participate

Ethical clearance was obtained from the Research Ethics Committee of the Faculty of Humanities at the University of Pretoria (reference number HUM 002/1220). Each participant provided written informed consent prior to data collection.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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