PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Healthcare utilization, cancer screening and potential barriers to accessing cancer care in Rural South-West Nigeria: A cross-sectional study.
AUTHORS	Sharma, Avinash; Alatise, Olusegun; O'Connell, Kelli; Gbenga, Ogunleye; Aderounmu, Adewale; Samson, Marquerite; Wuraola, Funmilola; Olasehinde, Olalekan; Kingham, T; Du, Mengmeng

VERSION 1 – REVIEW

REVIEWER	Al-Azri, Mohammed Sultan Qaboos University, Family Medicine and Public Health
REVIEW RETURNED	28-Oct-2020

GENERAL COMMENTS	Thank you for giving me the opportunity to review the manuscript. I think the manuscript discussed important issues related to cancer screening in Sub-Saharan Africa. However, I have the following comments: ABSTRACT 1.Can the authors name the validated questionnaire that was used in the study? 2.Part of the regression analysis was not included in the results. 3.The last statement “Increasing financial risk protection, awareness, and targeted resource allocation may help expand access” Can the government of Nigeria provide such a solution? If not, then such issues should be subjected to the availability of the resources from the government. Strengths and Limitations of the study 4.Will add another limitation as the study was conducted in one geographic area in Nigeria (Osun State, South-West Nigeria). INTRODUCTION 5.Provides more information about the availability of cancer screening for the common types of cancer and how the public attends to obtain such services. Where they are available? How they were accessed? Is it free or provided by the cost paid by the individual or insurances? 6.Are there any previous studies conducted in Nigeria to measure public awareness of cancer symptoms, risk factors, and barriers to seeking medical help? If yes, then this should be included. 7.Similarly, are there any previous studies conducted in Nigeria to explore public attitudes and barriers to cancer screening? If yes, then this should be included. METHODS 8.How sample size was calculated?

	9.How participants were invited? Please expand. 10.Any exclusion criteria? 11.Did the used questionnaire was tested for reliability (i.e. . Cronbach's alpha). If yes, what were the results? 12.If the questionnaire were assessed for external validity, then what were the results in comparison to others? 13.What was the response rate from the invited individuals? 14.The results of CRC might not reflect the sample of the Nigerian population as the majority (75%) of participants were female. 15.Did the number of high participants with hypertension (31.8%) was because the study provides free hypertension check-up? How the findings of hypertension (31.8%) in comparison to the general population of Nigeria? 16.The major issue that the questionnaire did not include was the barriers to the cancer screening program. This could include emotional barriers (e.ge worries of cancer diagnosis) and accesses barriers (e.g. locations, availability of transportation, etc.).

REVIEWER	Donkor, Andrew University of Technology Sydney Faculty of Health, IMPACCT (Improving Palliative, Aged and Chronic Care through Clinical Research and Translation)
REVIEW RETURNED	01-Nov-2020

GENERAL COMMENTS	The study describes the current healthcare utilization, cancer screening activities and potential barriers to accessing cancer care within a rural community-based adult population in South-West Nigeria. The study is a great addition to the literature on cancer screening in Africa. Minor specific suggestions for improving the paper include: 1. Consider rewriting the title of the manuscript. It is lengthy. Also, the phrase 'potential barriers to accessing cancer care in sub-Saharan Africa' introduces the issue of higher degree of generalisability. Please consider a title such as "Universal healthcare coverage, cancer screening and potential barriers to accessing cancer care in Rural South-West Nigeria: A cross-sectional study. 2. The methods section is well written, but it lacks structure. Remember majority of the readers will be busy clinicians and policymakers. The authors could consider the following subheadings under the methods to guide readers: study design; setting; participants; recruitment; variables (clearly define all outcomes and potential confounders); Questionnaire; data collection and statistical analysis. 3. Please describe all efforts used to address potential sources of bias. 4. Simple descriptive statistics were performed by the authors. Confounders such as age, education, marital status and tribe were not adjusted/controlled. The authors could consider adjusting all confounding variables to prevent mixing of effects.

REVIEWER	Huchko, Megan Duke Global Health Institute, Obstetrics and Gynecology
REVIEW RETURNED	13-Nov-2020

GENERAL COMMENTS	The authors have performed a cross-sectional study to better understand barriers to cancer screening, including knowledge,

	beliefs and health insurance status. The title is somewhat misleading in that there isn't a focus on universal health care, or its' impact on cervical cancer screening. There is also little evidence that screening services exists, regardless of whether they are covered by insurance. The authors touch on this in the introduction, but there is no data on whether the services are available in the region in which the surveys were carried out. This should be spelled out in the introduction or in the first paragraph of the methods section. Was this study a secondary analysis of a larger study? It seems, given the length of the interviews and collection of additional data, that there were primary aims that were not described fully here, but alluded to in the discussion. P12, lines 15-20: Manual breast examination by a health care worker was not captured and therefore the assessed intervention evaluated management at local secondary and tertiary health care facilities is unclear. Does this mean medical records were obtained to see if participants had received referral care at these locations? P21, line 43 should say "health care infrastructure" P21 Lines 47-50, the sentence starting "our study identifies that screening activities may be lacking and that the potential cost implications of accessing treatment when symptoms arise…" is not supported by the study findings. It is not clearly ascertained, through this study design, that the disparity is from lack of service delivery offering or lack of uptake. P 22, lines 26-29, "Our analysis provides some idea of how individuals navigated health system and their degree of engagement different levels"—needs editing, but also is not shown in the data. P25 Limitations: should include lack of data on whether screening was available, whether it was offered, or lack of questions about whether it was a financial hardship that discouraged/prevented people from accessing services.

VERSION 1 – AUTHOR RESPONSE

Reviewer 1

Thank you for your excellent review of our paper. In response to your comments we have made some adjustments to the paper.

ABSTRACT
1.Can the authors name the validated questionnaire that was used in the study?

The actual questionnaire was composed of questions made up of various different validated questionnaires as it comprised a wide range of subject areas. These have been referenced in the manuscript. To better reflect this we have removed the word "validated" from the abstract. The combined questionnaire that was used in the survey has now been validated separately but is awaiting publication.

2.Part of the regression analysis was not included in the results.

Perhaps this relates to the statement, “Cancer screening assessment was less frequent in those with less income and lower levels of education.” This statement is reflective of table 5 in the results.

3.The last statement “Increasing financial risk protection, awareness, and targeted resource allocation may help expand access” Can the government of Nigeria provide such a solution? If not, then such issues should be subjected to the availability of the resources from the government.

The Nigerian government has stated this as part of their goal in the National Cancer Control Plan 2018-2022 published in 2018. Universal health care access with health insurance does exist in two states and was intended to be rolled out across the nation by the government. We believe such a solution is in line with government aspirations and is possible with appropriate resource allocation.

Strengths and Limitations of the study
4.Will add another limitation as the study was conducted in one geographic area in Nigeria (Osun State, South-West Nigeria).

This has been added. We have also provided a comparison of the characteristics of our sample to the wider Nigerian population (urban and rural) as outlined in the Nigerian Demographic survey, so that readers can understand how our sample i

INTRODUCTION
5.Provides more information about the availability of cancer screening for the common types of cancer and how the public attends to obtain such services. Where they are available? How they were accessed? Is it free or provided by the cost paid by the individual or insurances?

The reality is that coordinated screening services are very limited – particularly in rural areas. Typically screening interactions occur at primary health care facilities or community health clinics for women – often when they are being seen during pregnancy or for other related health issues such as immunisations. Screening services for cervical and breast cancer have been implemented sporadically by both government and non-government organisations but predominantly in urban areas. https://www.canceraware.org.ng/post/2017/01/13/list-of-cervical-screening-centres The overwhelming majority of individuals in the region are symptomatic when they present with disease, the purpose of our study is to provide a snapshot of what individuals face so that more attention and focus can be placed on implementing national screening programs in these regions.

We have edited the introduction to reflect this.

6.Are there any previous studies conducted in Nigeria to measure public awareness of cancer symptoms, risk factors, and barriers to seeking medical help? If yes, then this should be included.

Yes – our own group has conducted studies on breast cancer awareness – these are referred to in the discussion.[1]

7.Similarly, are there any previous studies conducted in Nigeria to explore public attitudes and barriers to cancer screening? If yes, then this should be included.

Yes there are studies exploring this and we make reference to these in our discussion – see paragraph 2 line 1.

METHODS

8.How sample size was calculated?

The sample size was determined by capacity to conduct full interviews. We aimed to interview as many individuals as possible however required a minimum of 200 individuals to investigate another aim of the project to look at cancer risk factors.

9.How participants were invited? Please expand.

Participants were notified of the study through discussion at the weekly local community meetings in the month leading up to the study, advertisements on local radio-stations and through community workers visiting regional sites. (Now added to the methods).

10.Any exclusion criteria?

No direct exclusion criteria apart from the ability to attend the interview at the two study sites. (Also added to the methods)

11.Did the used questionnaire was tested for reliability (i.e. . Cronbach's alpha). If yes, what were the results?

(see response above - point 1 “ABSTRACT”)

12.If the questionnaire were assessed for external validity, then what were the results in comparison to others?

(see response above - point 1 “ABSTRACT”)

13.What was the response rate from the invited individuals?

Unfortunately due to the nature of the study design this is unable to be determined. However, 100% of individuals participating provided data for analysis. (added to results paragraph 1)

14.The results of CRC might not reflect the sample of the Nigerian population as the majority (75%) of participants were female.

We agree, and acknowledge this in the discussion of our results and strengths and weaknesses of the study.

15.Did the number of high participants with hypertension (31.8%) was because the study provides free hypertension check-up? How the findings of hypertension (31.8%) in comparison to the general population of Nigeria?

This figure is for hypertension is remarkably similar to systematic review and meta-analyses in the region. [2 3] This has also been recently acknowledged by the World Health Organization in its efforts to control hypertension in Nigeria.

https://www.afro.who.int/news/nigeria-collaborates-who-curb-hypertension-introduces-control-initiative#:~:text=The%20review%20estimated%20that%20prevalence,29.5%25%2C%20women%2031.1%25).

16.The major issue that the questionnaire did not include was the barriers to the cancer screening program. This could include emotional barriers (e.ge worries of cancer diagnosis) and accesses barriers (e.g. locations, availability of transportation, etc.).

We agree with this statement. We have tried to capture some of the potential barriers though an analysis of socio-demographic barriers, but this was not directly asked in the questionnaire, we acknowledge this in our discussion (second to last paragraph).

“Whilst we have documented low levels of screening activities and associations with income and education, we did not directly require individuals to state specifically their personal reasons for not being screened to delineate availability, awareness or finances.”

We agree that a detailed qualitative analysis of these barriers would be worthwhile and is the subject of our future work in the region.

Reviewer: 2

Reviewer Name: Andrew Donkor

Institution and Country: University of Technology Sydney, Australia

Please state any competing interests or state ‘None declared’: None declared

Comments to the Author

The study describes the current healthcare utilization, cancer screening activities and potential barriers to accessing cancer care within a rural community-based adult population in South-West Nigeria.

The study is a great addition to the literature on cancer screening in Africa. Minor specific suggestions for improving the paper include:

1. Consider rewriting the title of the manuscript. It is lengthy. Also, the phrase ‘potential barriers to accessing cancer care in sub-Saharan Africa’ introduces the issue of higher degree of generalisability. Please consider a title such as “Universal healthcare coverage, cancer screening and potential barriers to accessing cancer care in Rural South-West Nigeria: A cross-sectional study.

Once again we thank the reviewer for the positive feedback. In line with the comments from reviewer 1 we have adjusted the title of the manuscript.

2. The methods section is well written, but it lacks structure. Remember majority of the readers will be busy clinicians and policymakers. The authors could consider the following subheadings under the methods to guide readers: study design; setting; participants; recruitment; variables (clearly define all outcomes and potential confounders); Questionnaire; data collection and statistical analysis.

We have completely restructured the methods in line with the subheadings detailed by the reviewer and thank the reviewer for this suggestion.

3. Please describe all efforts used to address potential sources of bias.

1) Questionnaire

We ensured that the questionnaire used was developed in collaboration with local clinicians, epidemiologists, and nutritionists, and was derived by adapting features from validated and/or widely implemented local or nationwide surveys. This included the Nigeria Demographic and Health Survey, Nigeria General Household Survey, World Health Organization-endorsed Global Physical Activity Questionnaire and the Nurses’ Health Study questionnaire.

2) Interviewers

Our research assistants conducting the interviews with participants underwent a two-day training program that involved education into the research aims, methodology, and ethics as well as interview techniques through the use of role playing exercises. The interviewers also participated in pilot testing of the questionnaire in a setting away from the sample sites. They were all resided locally in Ile-Ife and were well versed in the local dialect.

3) Measures for external validity

Ultimately, despite our best efforts to encourage participation through involvement of community leaders our the population has been sampled without a specific sampling frame. However, because of the paucity of data that exists in the area in the region we feel it is important to provide a description of the subject matter. Accordingly, we have gone to great length so record demographic and socio-economic data on all of the participants so that our sample population can be compared to other parts of Nigeria (both rural and urban). This has been done by utilising the Nigerian Demographic and Health survey data (table 2b) and the equivalent parameters for Nigeria from the multi-dimensional poverty index (MPI) developed by the Oxford Poverty and Human Development Initiative. Based on these measures we believe that

4) Analysis/Results

In presenting the results we have not overstated any findings – we provide descriptive statistics and acknowledge the limits of analysis that can be performed with this sample size.

4. Simple descriptive statistics were performed by the authors. Confounders such as age, education, marital status and tribe were not adjusted/controlled. The authors could consider adjusting all confounding variables to prevent mixing of effects.

In Table 5 of the results we attempted to control and adjust for these factors and also performed measures of association by age, education, marital status. We have adjusted the wording in paragraph 6 of the results to reflect this.

Reviewer: 3
Reviewer Name: Megan Huchko
Institution and Country: Duke University, USA Please state any competing interests or state ‘None declared’: None Declared

Comments to the Author
The authors have performed a cross-sectional study to better understand barriers to cancer screening, including knowledge, beliefs and health insurance status. The title is somewhat misleading in that there isn’t a focus on universal health care, or its’ impact on cervical cancer screening.

Once again we thank this reviewer for taking the time to provide valuable feedback. We have edited the title of the study – in line with reviewer 2’s comments also.

There is also little evidence that screening services exists, regardless of whether they are covered by insurance. The authors touch on this in the introduction, but there is no data on whether the services are available in the region in which the surveys were carried out. This should be spelled out in the introduction or in the first paragraph of the methods section.

We have updated the introduction in line with these comments and also reviewer 1's comments. See paragraph 3.

Was this study a secondary analysis of a larger study? It seems, given the length of the interviews and collection of additional data, that there were primary aims that were not described fully here, but alluded to in the discussion.

This study was part of a broader capacity building project in the region to improve cancer care. It was a baseline study to assess access to cancer services but also explore unique risk factors for cancer – such as diet, exercise and environmental exposure. This has been added to the methods.

P12, lines 15-20: Manual breast examination by a health care worker was not captured and therefore the assessed intervention evaluated management at local secondary and tertiary health care facilities is unclear. Does this mean medical records were obtained to see if participants had received referral care at these locations?

No, medical records were not obtained for all participants to verify responses to the survey P21, line 43 should say "health care infrastructure" This has been updated.

P21 Lines 47-50, the sentence starting "our study identifies that screening activities may be lacking and that the potential cost implications of accessing treatment when symptoms arise…" is not supported by the study findings. It is not clearly ascertained, through this study design, that the disparity is from lack of service delivery offering or lack of uptake.

We agree that the disparity may be from lack of service delivery or lack of uptake and have edited these lines accordingly

P 22, lines 26-29, "Our analysis provides some idea of how individuals navigated health system and their degree of engagement different levels"—needs editing, but also is not shown in the data.

We agree this is not directly shown in the data. We have removed the statement and edited the paragraph for better clarity.

P25 Limitations: should include lack of data on whether screening was available, whether it was offered, or lack of questions about whether it was a financial hardship that discouraged/prevented people from accessing services.

This has been added to the limitations – see second last paragraph of discussion.

References:

1. Olasehinde O, Alatise OI, Arowolo OA, et al. Barriers to mammography screening in Nigeria: A survey of two communities with different access to screening facilities. *Eur J Cancer Care (Engl)* 2019;28(2):e12986. doi: 10.1111/ecc.12986 [published Online First: 2019/01/08]
2. Adeloye D, Basquill C, Aderemi AV, et al. An estimate of the prevalence of hypertension in Nigeria: a systematic review and meta-analysis. *J Hypertens* 2015;33(2):230-42. doi: 10.1097/hjh.0000000000000413 [published Online First: 2014/11/08]
3. Idris IO, Oguntade AS, Mensah EA, et al. Prevalence of non-communicable diseases and its risk factors among Ijegun-Isheri Osun residents in Lagos State, Nigeria: a community based cross-sectional study. *BMC Public Health* 2020;20(1):1258. doi: 10.1186/s12889-020-09349-2

VERSION 2 – REVIEW

REVIEWER	Al-Azri, Mohammed Sultan Qaboos University, Family Medicine and Public Health
REVIEW RETURNED	26-May-2021

GENERAL COMMENTS	Thank you for giving me the opportunity to review the revised manuscript. I think the manuscript has improved, but still some comments were not addressed adequately. Please see below the remaining comments: ABSTRACT 1.Part of the regression analysis was not included in the results. 2.The last statement “Increasing financial risk protection, awareness, and targeted resource allocation may help expand access” Can the government of Nigeria provide such a solution? If not, then such issues should be subjected to the availability of the resources from the government. METHODS 3.How sample size was calculated? 4.Did the used questionnaire was tested for reliability (i.e. . Cronbach's alpha). If yes, what were the results? 5.The results of CRC might not reflect the sample of the Nigerian population as the majority (75%) of participants were female. 6.Did the number of high participants with hypertension (31.8%) was because the study provides free hypertension check-up? How the findings of hypertension (31.8%) in comparison to the general population of Nigeria? 7.The major issue that the questionnaire did not include was the barriers to the cancer screening program which is one of the study’s limitations. This could include emotional barriers (e.ge worries of cancer diagnosis) and accesses barriers (e.g. locations, availability of transportation, etc.).

REVIEWER	Donkor, Andrew University of Technology Sydney Faculty of Health, IMPACCT (Improving Palliative, Aged and Chronic Care through Clinical Research and Translation)
REVIEW RETURNED	19-May-2021

GENERAL COMMENTS	Authors have addressed comments raised

VERSION 2 – AUTHOR RESPONSE

Reviewer: 1

Dr. Mohammed Al-Azri, Sultan Qaboos University Comments to the Author:

Thank you for giving me the opportunity to review the revised manuscript. I think the manuscript has improved, but still some comments were not addressed adequately. Please see below the remaining comments:

ABSTRACT

1. Part of the regression analysis was not included in the results.

We have added the following sentence in the Abstract per the Reviewer's suggestion:

"Using a multivariable logistic regression model including personal income, insurance status, and education, higher personal income was associated with more cancer screening activity (OR 2.7 95%CI 1.3-5.7 p<0.01)."

2. The last statement "Increasing financial risk protection, awareness, and targeted resource allocation may help expand access" Can the government of Nigeria provide such a solution? If not, then such issues should be subjected to the availability of the resources from the government.

We have added this suggested qualification to the last statement in the abstract:

"Subject to availability of governmental resources, increasing financial risk protection, awareness, and targeted resource allocation may help expand access in Nigeria."

The Nigerian government has highlighted these goals as part of their National Cancer Control Plan 2018-2022 published in 2018. Universal health care access with health insurance does exist in two states and was intended to be rolled out across the nation by the government. We therefore believe such a solution is in line with government aspirations and is possible with appropriate resource allocation.

METHODS

3. How sample size was calculated?

This study was part of a broader capacity building project in the region to improve cancer care and prevention in this understudied population. It was a baseline study to assess access to cancer services but also served as a pilot to explore endemic risk factors for cancer – such as unique dietary, exercise and environmental exposures. Sample size for this study was therefore based on resource capacity of each town hall, available number of interviewers to administer the questionnaire, and the size of each rural community in which we recruited; enrolment was therefore capped at a maximum of 300 participants at Ijebu-Jesa and 100 at Ere-Jesa. We successfully recruited 346 individuals during the recruitment period.

We have expanded this information in the methods.

4. Did the used questionnaire was tested for reliability (i.e. . Cronbach's alpha). If yes, what were the results?

As described in methods, our study questionnaire comprised a wide range of items derived by adapting features from validated and/or widely implemented local or nationwide surveys. We therefore did not additionally test for reliability and our study was intended to capture a cross-sectional snapshot of our rural communities. We expect low social mobility in our two rural Nigerian towns and therefore limited changes over time for the sociodemographic features collected in our questionnaire.

We have added this information in the methods.

5. The results of CRC might not reflect the sample of the Nigerian population as the majority (75%) of participants were female.

We agree and have added this in the discussion of the limitations in our study:

“For instance, 75% of participants in our study were female, which may potentially limit the generalizability of our findings. However, it is reassuring we observed overall consistency with national demographic indicators (e.g., income, education, and living conditions), which indicates that our sample is likely reflective of rural community-dwelling individuals in the wider region.”

6. Did the number of high participants with hypertension (31.8%) was because the study provides free hypertension check-up? How the findings of hypertension (31.8%) in comparison to the general population of Nigeria?

We have added text and citations in the discussion in response to these questions:

“For example, the high prevalence of hypertension in this population is remarkably similar to that reported in a systematic review and meta-analysis conducted in the region. The high burden of hypertension in the region has also been recently acknowledged by the World Health Organization in its efforts to control hypertension in Nigeria.”

7. The major issue that the questionnaire did not include was the barriers to the cancer screening program which is one of the study’s limitations. This could include emotional barriers (e.ge worries of cancer diagnosis) and accesses barriers (e.g. locations, availability of transportation, etc.).

We agree with this important point and expand on this limitation in our discussion in the following text:

“Whilst we have documented low levels of screening activities and associations with income and education, we did not directly require individuals to state specifically their personal reasons for not being screened; we were therefore unable to delineate specific barriers to cancer screening, such as emotional barriers (e.g., concern about cancer diagnosis, limited awareness) and barriers to access (e.g., screening locations, availability of transportation, limited finances, etc.). Detailed qualitative analysis of these barriers would be worthwhile and is the subject of our future work in the region.”

Reviewer: 2

Mr. Andrew Donkor, University of Technology Sydney Faculty of Health, Korle Bu Teaching Hospital
Comments to the Author:

1. Authors have addressed comments raised

Thank you for reviewing.

VERSION 3 – REVIEW

REVIEWER	Al-Azri, Mohammed Sultan Qaboos University, Family Medicine and Public Health
REVIEW RETURNED	11-Jul-2021

GENERAL COMMENTS	All the previous comments were dressed.