Knowledge, Attitudes and Merits of Clinical Genomics amongst Cancer Clinicians in Nigeria

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Abstract

Background: Genomic sequencing is increasingly been instituted to improve the understanding of molecular causes of cancer and to help inform patient's diagnosis and treatment. There are several challenges to the integration of clinical sequencing into routine clinical practice in Africa; such as clinicians' attitude and literacy to genomics and experience working with genomics. The aim of this study is to evaluate the knowledge of genomic education amongst African cancer clinicians and their attitude towards adopting genetics in their practices.

Methods: We conducted a survey amongst cancer clinicians at a tertiary level hospital, in Lagos, Nigeria between September 2019 to April 2020. The survey instrument was an 18-item self-report questionnaire which comprised of six sections. Some sections were categorized and each category ranked.

Results: A total of 35 participants took part in the study with predominantly male respondents. Majority of the respondents were >5 years in the practice of oncology. Majority of the respondents ranked themselves as "knowledgeable" to basic genetics and less knowledgeable to advance genetics. They rated sufficiency of genomic education as low in medical schools and clinical training institutions. They ranked the importance of genomics to clinical practice as major but clinicians' attitudes towards the clinical application of genomics remains sceptical.

Conclusion: While there were limitations to this study, the high concentration of clinicians and their response rate was an advantage.

Keywords: Cancer; Genomics; Clinicians; Africa

Introduction

Genomic medicine involves the use of high throughput sequencing to improve the understanding of molecular causes of diseases such as cancer and to help inform patient's diagnosis and treatment. Since the completion of the human genome project in 2003 and the 100K genome project UK in 2018, researchers have and continue to look forward to its contribution to radical breakthrough in clinical practice. Physicians have begun to adopt genomic data and technologies into clinical practice and gene testing in the form of clinical sequencing have become integrated into the standard of care for the treatment for some specific cancer types. There are several challenges to the integration of clinical sequencing into routine clinical practice; such as clinicians' attitude and literacy to genomics and experience working with genomics [1]. The main challenges are the lack of early education and awareness to genomic education amongst healthcare professionals and clinicians often report their inadequate level of genomic sequencing knowledge as an impediment to its utilization. While the current status of genomic education in Europe and American medical schools are limited, that of Africa and other emerging healthcare systems is almost non-existent. Furthermore, the attitude towards increasing their genomic knowledge and a desire to adopt genomics into their practices in Europe and America remains split. The aim of this study is to evaluate the knowledge of genomic education amongst African cancer clinicians and their attitude towards adopting genetics in their practices [2].

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Materials and Methods

We conducted a survey amongst cancer clinicians at a tertiary level hospital, in Lagos, Nigeria between September 2019 to April 2020. This institution is a 1,000-bed tertiary hospital located in the cosmopolitan city of Lagos, the commercial nerve centre of Nigeria, with over 20 million inhabitants [3]. The survey instrument was an 18-item questionnaire which comprised of six sections comprising:

- Clinico-demographic
- Genomic knowledge
- Sufficiency of genomic education
- Relevance of improving knowledge of genomic education and responsibility for updating this knowledge
- Importance of genomics to clinical application
- Concerns of expanding genomics to clinical application

Our survey was adopted based on the Middleton et al studies. The first section of the survey was on clinic-demographic information comprising; gender, clinician cadre with a minimum cadre being a senior registrar, years of practicing oncology related medicine and type of cancer treatment specialization-surgery, radiotherapy and chemotherapy. The second section of the survey was to appraise respondent's genomic knowledge across topics with rising levels of difficulty, comprising; basic genetics, genotyping and variants and next generation sequencing. Each appraisal was assessed based on a ranking scale of 0=no knowledge; 1=little knowledge; 2=knowledgeable; 3=very knowledgeable and 4=expert. The third section of the survey appraised the genomic education sufficiency across undergraduate (medical school) and postgraduate (residency) training and the ranking score were; 0=do not know, 1=not sufficient and 2=sufficient. The fourth section of the survey appraised improving knowledge of genomic education post primary qualification and was ranked as; 0=unimportant, 1=somewhat important, 2=important and 3=very important. In addition, this section appraised who should be responsible for updating this knowledge and was ranked as; 1=personal, 2=host institution/hospital [4]. The fifth section appraised the importance of genomics to clinical application and this was rated across diagnosis, drug discovery, treatment and prolonging lives and ranked as; 0=no impact, 1=minor impact, 2=major impact. The sixth section appraised the concerns of expanding genomic into the clinics and this was rated across five categories of concerns comprising; clinical usefulness, cost, immaturity of genomic science, patient's comprehension of genomics and unexpected germline findings. It was ranked as 0=unconcerned, 1=somewhat unconcerned, 2=somewhat concerned and 3=very concerned. The median score for years of practice was used as the threshold for categorisation of years of practicing oncology. Descriptive statistics was reported through categorical responses. Inferential statistics between independent variables e.g. gender, years of practice, oncology type and genomic knowledge, was also reported. Our institutional review board adjudged that no approval was required for this questionnaire based study [5].

Results

Participants characteristics

A total of 35 participants took part in the study. Our results showed a predominantly male dominated responders with 8 females and 27 males. Twelve respondents were in the consultant cadre while 23 were in the senior registrar cadre. Majority of the respondents were >5 years in the practice of oncology and the type of treatment was also recorded (Table 1) [6].

Table 1: Demography of participants.

Variables	Frequency	Percentages (%)
Gender		
Female	8	23%
Male	27	77%
Cadre of clinician		
Snr registrar	23	66%
Consultant	12	34%
Years of practicing oncology		
≤ 5 years	15	43%
>5 years	20	57%
Type of cancer management		
Chemotherapy	2	6%
Radiotherapy and chemotherapy	3	9%
Surgeons	30	85%

Genomic knowledge

Majority of the respondents ranked themselves as "knowledgeable" 21 (60%) to basic genetics with 9 (26%) responders expressing "little knowledge" to same topic. However, the result shifted to 14 (40%) responders claiming "knowledgeable" when it was a more difficult topic of genotyping and variants with 15 (43%) claiming "little knowledge" and 4 (11%) responders claiming "no knowledge" to same topic. One respondent claimed to be an expert in all three topics of genomic knowledge (Table 2) [7].

Table 2: Genomic knowledge.

Topics	Knowledgeable	No knowledge	Very knowledge	Little	Expert
Basic genetics	4 (11)%	0	1 (3%)	9 (26%)	21 (60%)
High throughput data, genotyping, variants	1 (3%)	4 (11%)	1 (3%)	15 (43%)	14 (40%)
Next generation sequencing	0	12 (34%)	1 (3%)	13 (37%)	9 (26%)

Sufficiency level of genomic education

The lesser cadre of our respondents graduated from medical school over 5 years ago thus are very familiar with the medical school curriculum. When asked about sufficiency of genomic education across medical school and residency programmes, the same number of responders-24 (69%), thought that the curriculum in medical school and residency training programmes was "not sufficient" while slightly more 7 (20%) responders thought it was "sufficient" in medical school compared to residency programme 6 (17%). Again, slightly more "did not know" if medical school 5 (14%) was offered sufficient genomic education compared to residency programme 4 (11%) (Table 3) [8].

Table : Genomic education sufficiency and improving knowledge.

Topic	Do not know	Sufficient	Not sufficient	-
Genome medical school	6 (17%)	5 (14%)	24 (69%)	-
Genome residency	7 (20%)	4 (11%)	24 (69%)	-
	Important	**Very important**	**Unimportant**	**Somewhat important**
Importance of improving knowledge for clinicians	9 (26%)	24 (69%)	0	2 (6%)
	Institution	**Personal**	-	-
Responsible for updating	30 (86%)	5 (14%)	-	-

Improving genomic knowledge and responsibility

In the same vain, majority responders-24 (69%), thought that improving genomic education amongst clinicians was "very important" with no responder thinking it was "unimportant". Also, 30 (86%) respondents claimed the responsibility for this updating of education should lie with their host "institutions" while 5 (14%) claimed it should be individually borne [9].

Importance of genomics to clinical application

The importance of genomics in clinical application was also surveyed across four categories of clinical application, comprising; diagnostics, drug recovery, selecting course of treatment and prolonging lives. Majority of the responders across all 4 categories (83%-89%) felt that genomics should play a "major impact" in clinical application while 2%-6% felt if should have a minor impact (Table 4) [10].

Table 4: Importance of genomics to clinical application**.**

Importance	Major impact	No impact	Minor impact
Diagnostics	29 (83%)	0	6 (17%)
Drug recovery	31 (89%)	1 (3%)	2 (6%)
Selecting course of txt	31 (89%)	0	3 (9%)

Prolonging lives	29 (83%)	0	5 (14%)

Concerns about expanding genomics to the clinic

Clinician's concerns of expanding genomic science to their practices was also surveyed. Categories of concerns surveyed were clinical usefulness, cost, immaturity of genomic science, patient's comprehension of genomics and unexpected germline findings. Respondents ranked "very concerned" for cost with 74% followed by clinical usefulness-49%. "Somewhat concerned" was the second ranking across all categories of concern (Table 5) [11].

Table 5: Concerns about expanding genomic science to the clinic.

Concerns	Somewhat concerned	Unconcerned	Very concerned	Somewhat unconcerned
Clinical usefulness	13 (37%)	0	17 (49%)	5 (14%)
Cost	6 (17%)	0	26 (74%)	3 (9%)
Inaccuracy of genomic science	14 (40%)	0	16 (47%)	5 (14%)
Patient's/clinician's comprehension of genomics	12 (34%)	3 (9%)	15 (43%)	5 (14%)
Unexpected germline findings	15 (43%)	2 (6%)	15 (43%)	3 (9%)

Discussion

Low level of genomic literacy

Awareness of genomic education is increasingly been required as we go forward with integration of clinical genomic services and sequencing data into the diagnosis of cancer types. While this integration has progressed in developed healthcare systems, emerging healthcare systems like you find in Africa would need to develop strategies for an impending integration. Our results show a low level of literacy and the need for better strategy and guidelines for genomic education amongst clinicians. While our clinicians showed knowledge for basic genomics, they appeared unknowledgeable about more complex genomics. Most respondents agreed that it was very important to improve their understanding of genomics and its clinical application and funding for this re-education should not be out of pocket. These findings are supported by other survey studies. Medical school curriculum and residency training guidelines are two ways for updating knowledge and strategy implementation as respondents reported that both education platforms currently provide insufficient genomic knowledge. It is the submission of this study that these platforms provide an opportunity to fill this gap in genomic knowledge amongst clinicians. However, we caution that the large scope of genomics and its technology, brings to question how much knowledge can actually be incorporated into these curriculums to achieve requisite impact. Should that be the case, these curriculums can be augmented with additional professional courses and training outside these two major platforms [12].

Importance and attitudes towards genomic technology

Our results also showed that respondents feel genomics is very important to diagnostics, drug recovery and other clinical applications, however, responders' attitude to incorporating genomics into diagnosis and treatment remains sceptical. This scepticism was due to clinician's concerns on cost, its clinical usefulness, the extra effort, the inaccuracy of genomic science and clinician's comprehension. These findings were consistent to other reports in the literature which reported that clinicians who do not have a positive attitude towards genomics tend to have low confidence in genomics and lower baseline understanding [13]S.

Conclusion

The main potential limitations of this study are the single centre nature and small sample size, which limited our ability to apply more analyses such as logistic regression, to identify more associations between variables. We also relied on some self-report item, like our tools for measuring the levels of genomic knowledge. Other studies have employed elaborate tests to measure genomic knowledge. We ruminated over this option but did not pursue it because of the clinical nature of the study environment of the survey and the limited time respondents would most likely have to complete questionnaires. However, a strength of the study is the concentration of cancer clinicians in the hospital and the short response rate.

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