Open access behaviours and perceptions of health sciences faculty and roles of information professionals

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Abstract

Objective: This study sought to investigate the faculty's awareness, attitudes and use of open access, and the role of information professionals in supporting open access (OA) scholarly communication in Tanzanian health sciences universities.

Methods: A cross-sectional survey was conducted. Semi-structured interviews were conducted with 16 librarians, while questionnaires were physically distributed to 415 faculty members in all eight Tanzanian health sciences universities, with a response rate of 71.1%.

Results: The study found that most faculty members were aware about OA issues. However, the high level of OA awareness among faculty members did not translate into actual dissemination of faculty's research outputs through OA web avenues. A small proportion of faculty's research materials was made available as OA. Faculty were more engaged with OA journal publishing than with self-archiving practices. Senior faculty with proficient technical skills were more likely to use open access than junior faculty. Major barriers to OA usage were related to ICT infrastructure, awareness, skills, author-pay model, and copyright and plagiarism concerns. Interviews with librarians revealed that there was a strong support for promoting OA issues on campus; however, this positive support with various open access-related tasks did not translate into actual action. It is thus important for librarians and OA administrators to consider all these factors for effective implementation of OA projects in research and academic institutions.

Conclusion: This is the first comprehensive and detailed study focusing on the health sciences faculty's and librarians' behaviours and perceptions of open access initiatives in Tanzania and reveals findings that are useful for planning and implementing open access initiatives in other institutions with similar conditions.

Keywords: Africa, East; health professionals; health sciences; Librarianship, academic; libraries; open access

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Key Messages

- Universities and research institutions should establish institutional repositories to improve the dissemination of their research output.
- Universities and research institutions in developing countries should improve the ICT infrastructure by looking into ways to increase the Internet bandwidth, access to computers and alternative sources of power.
- Librarians should create awareness about OA and improve information literacy skills of faculty through workshops, participation in university meetings, public lectures, print materials and electronic communication.
- Librarians should provide information services that focus on OA issues, such as copyright management, in order to assist researchers to understand the legal implications of self-archiving their research outputs.
- Universities and research institutions should develop mandate policies, with appropriate quality assurance measures to enhance adoption of OA.

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Introduction

Health scientists in developing countries have a critical role to play in disseminating their research outputs to optimise access and use of such scholarly information and reduce global disparities in health. The open access (OA) movement has improved the way researchers conduct and share research, primarily by increasing the reach of scholarly communication across the world. OA publications are 'digital, online, free of charge, and free of most copyright and licensing restrictions'[1]. Several studies, however, report that the adoption and participation of faculty in OA publishing and self-archiving practices are low in Africa, including Tanzania[2–5]. Such OA contributions are, however, crucial for Africa. Otherwise, local research outputs are not disseminated where they matter most across the region. In Tanzania, previous studies have investigated similar topics, although most have focused on the attitudes of faculty in a single university[4], or from six public Tanzanian universities[5], or from eight universities in seven countries in the southern African region including one university from Tanzania[2]. Therefore, the topic on faculty OA behaviours and perceptions is inadequately explored, especially in the Tanzanian health sciences universities.

OA offers new opportunities and challenges for librarians. OA may help to reduce budgets of acquiring information materials and to negotiate costs for subscribing to e-resources[6]. The adoption of OA in institutions presents challenges such as demands for new skills and roles for librarians[6]. However, most studies in Africa including Tanzania have investigated the OA behaviour from the faculty's perspectives[2–5]. Only a few studies[6,7] have surveyed other institutional stakeholders such as academic libraries. Librarians are important stakeholders in managing both print and electronic scholarly outputs, establishing institutional repositories, promoting OA awareness in the institutions and participating in the evolving scholarly communication process[6,7]. It is important to investigate the role of librarians as change agents in managing and promoting OA activities in health sciences universities in Tanzania.

This study sought to assess the faculty behaviour and perceptions of OA, and the role of the academic library in supporting OA initiatives in the Tanzanian health sciences universities. The specific objectives of the study included the following:

- To determine the level of OA adoption and promotion in the health sciences universities from the librarians' perspectives.
- To investigate faculty's awareness and usage of OA approaches.
- To determine the faculty's perceptions about OA approaches.
- To investigate factors that inhibit OA from the faculty's and librarian's perspectives.
- To identify librarians roles in fostering OA issues in the health sciences universities.

Literature review

Studies indicate that the awareness of general OA issues among the research community is gradually growing. A recent longitudinal study of research on OA journals since 1990s revealed that the 'rate of authors who were not aware about OA was as high as around 50% in the 1990s, but dropped to below 15% by 2007'[8]. Similar observations were made in other studies[2,5,9,10]. Despite the growing level of OA awareness, literature shows that faculty are not familiar with specific OA issues such as self-archiving practices or the existence of institutional repositories (IR) in their institutions. A survey study of 1296 authors indicated that a substantial proportion of authors were unaware of the possibility of providing OA to their work by self-archiving[11]. Other studies have also indicated that a majority of researchers did not know if their universities had an institutional repository, such as in developed countries[12–14], and developing countries[7,15,16].

Similar to previous studies[12,17], a recent longitudinal study indicated a trend of gradual increase in the number of scholars who publish in author paid 'gold' OA journals over the years, but the publishing rate did not reach a high level by the end of the sequence of observations[8]. Other studies, however, have shown that an increasing number of researchers are being involved in gold OA publishing such as a study of OA publishing (SOAP) of 38 358 researchers from 162 countries[18]. Therefore, publishing rates in OA journals may differ according to location and individuals.

Faculty self-archiving practices are also reported to be low across the world. Research shows that only 15% of the estimated 2.5 million peer-reviewed journal articles are being self-archived by their authors every year ('green' OA)[11]. Similar findings were revealed by other studies in developed countries[11,14,17] and in developing countries[4,5,15,16]. Therefore, awareness remains higher than participation, especially in green OA.

Various studies have identified reasons why OA publishing and self-archiving in IRs have gained so little adoption. These barriers are related to research misconceptions and fears related to violating publishers' copyrights, concern with plagiarism, the learning curve, time and effort involved in depositing in IRs and lack of awareness about OA benefits[5,7,13,15,17,19–21]. Other factors are related to concerns about the quality of OA venues, such as the perceived low prestige of OA journals, concerns over the peer review process of OA journals, lack of peer review in IRs and a perceived lack of impact factor in OA publishing[5,12,15,18]. The gold OA model was criticised on the grounds of the lack of awareness of which journals publish with OA and the author charges[10]. Other barriers identified from developing countries are related to funding issues, fundamental problems related to the digital divide, lack of institutional policies for OA and weak institutional infrastructures[5,22,23]. It is important to consider all these barriers when conducting a study in the African setting.

Ten years after launching a worldwide OA campaign, the Budapest Open Access Initiative (BOAI) released another statement in 2012 which recommends that every higher learning institution should develop OA polices and establish or join an OA repository[24]. Evidence shows an increase of content items for more than half of the repositories after a policy mandate has been in place[25]. However, to positively affect the rate of repository content accumulation, awareness of mandate policies must be created and strategies for effective implementation developed. Other challenges regarding digital divide also play a key role, especially in the African setting as will be demonstrated in this study.

Literature shows that libraries are often actively engaged in educational activities on scholarly communication issues, for example 75% of the libraries in the study by Newman[26]. However, in a national survey of academic librarians in United States, Palmer found that 'only 20% of the libraries were involved in education campaigns relating to OA'[6]. It is important to assess the perceived roles of librarians in facilitating OA initiatives in the developing countries setting as will be demonstrated in this study.

Methodology

The study conducted a cross-sectional survey, where questionnaires were physically distributed to faculty, while semi-structured interviews were conducted with librarians. The study was conducted in all eight health sciences universities in Tanzania, which included Muhimbili University of Health and Allied Sciences, International Medical and Technological University, St. Francis University College for Health and Allied Sciences, Kilimanjaro Christian Medical University College, University of Dodoma, Aga Khan University, Catholic University of Health & Allied Sciences and Hubert Kairuki Memorial University.

The sample size was determined using Kish formula for cross-sectional studies[27]. This sample was calculated at 95% confidence interval of estimate and margin of error in the estimate equal to 3. The stratified random sampling procedure was used to select a sample of faculty ($n = 415$) from a total population of 679. The response rate was 71.1%. The study was approved by the Muhimbili University of Health and Allied Sciences ethical review board. A structured questionnaire as shown in Appendix 1 was used to collect data, where survey questions were developed based on existing, tested and verified instruments[5,11,13,15].

The semi-structured interviews were conducted with library directors and deputy directors in all eight Tanzanian health sciences universities, and thus, a total of 16 librarians were interviewed. Librarians were involved in the study because they play a key role in the development and support of OA initiatives in academic institutions. The interviews aimed to ascertain the level of OA adoption, barriers to OA adoption and the librarians' roles in fostering OA issues in the surveyed universities.

The questionnaires and interview guides were first pre-tested with a small pilot group of 30 academics and six librarians from the University of Dar es salaam and Sokoine University of Agriculture. An informed consent form was also used to facilitate voluntary participation in the study. Descriptive statistics were performed using SPSS version 16. A chi-square test was used to relate the association between demographic variables and faculty's behavioural usage of OA. The statistical significance was defined as P-value < 0.05. Cramer's V correlations were used to determine the strength of the relationship between the demographic variables and OA usage. According to Griffiths, the correlations of Cramer's V 'ranges between zero and one; a high value indicates a powerful trend'[28]. This study will use the descriptors in Table 1 to interpret the coefficients of Cramer's V as recommended by Cohen[29].

Results

The demographical information of study participants is presented in Table 2. A total of 295 respondents of 415 sampled participated in the study.

A total of 16 librarians were interviewed, where nine were male. The mean age of librarians was 42 years. Most librarians had Master's degrees (56.2%, $n = 9$) and Bachelor's degrees (37.5%, $n = 6$).

Current state of OA adoption and promotion in health sciences universities: librarians' perspectives

The study found that only one institution hosted a local journal, while another University had an institutional repository. Three Universities intended to establish the institutional repository policies,

Table 2 Faculty's demographic details

	n	%
Gender		
Male	189	64.1
Female	106	35.9
Age		
30 years and below	21	7.1
31–40	101	34.2
41–50	112	38.0
51–60	54	18.3
61 and above	7	2.4
Academic qualification		
PhD	93	31.5
Masters	141	47.8
Postgraduate diploma	18	6.1
Bachelor/Doctor of medicine/Dentistry	43	14.6
Professional rank		
Professor	15	5.1
Associate professor	26	8.8
Senior lecturer	83	28.1
Lecturer	68	23.1
Assistant lecturer	60	20.3
Tutorial assistant	43	14.6
Discipline		
Medicine	137	46.4
Nursing	40	13.6
Biological sciences	36	12.2
Pharmacy	30	10.2
Public health and allied sciences	33	11.2
Allied health sciences	9	3.1
Dentistry	10	3.4

while OA issues had not yet been discussed at the Universities strategic meetings. The low rate of OA adoption was attributed to the fact that few librarians were engaged in OA activities. The findings indicate that less than half of librarians (43.8%, $n = 7$) monitored at least several times per month mailing lists, websites and/or blogs that discuss OA (see Table 3). Most librarians did not discuss OA issues with other librarians or faculty within their institutions (62.5%, $n = 10$).

Faculty awareness and utilisation of OA scholarly communication

Despite the low level of OA adoption, the majority of respondents (93.5%; $n = 276$) in this study were aware of OA issues. Among those 93.5% respondents, most faculty were familiar with OA journals (78.3%; $n = 216$), which was followed by

Table 1 Descriptors for reporting and interpreting effect size of Cramer's V

Effect size statistic	Values	Interpretation of effect size
Cramer's V	0.10	Small effect size
	0.30	Medium effect size
	0.50	Large effect size

Table 3 Performed OA activities by librarians

	Never		Several times a year		Several times a month		Several times a week		Everyday	
	n	%	n	%	n	%	n	%	n	%
On average, I monitor mailing lists, websites and/or blogs that discuss OA.	6	37.5	3	18.8	2	12.5	3	18.8	2	12.5
On average, I read professional literature that discusses OA	5	31.2	3	18.8	4	25.0	2	12.5	2	12.5
On average, I discuss OA with librarians at campuses outside my own	7	43.8	2	12.5	4	25.0	1	6.2	2	12.5
On average, I discuss OA with librarians at my campus	10	62.5	1	6.2	2	12.5	2	12.5	1	6.2
On average, I discuss OA with non-librarian, academic professionals	10	62.5	2	12.5	1	6.2	2	12.5	1	6.2
On average, I discuss OA with administrators at my library	9	56.2	1	6.2	5	31.2	0	0.0	1	6.2
On average, I discuss OA with non-library administrators at my campus	8	50.0	4	25.0	2	12.5	2	12.5	0	0.0

IRs (36.6%; $n = 101$), self-archiving (20.7%; $n = 57$) and the Budapest OA initiative[24] (8.3%; $n = 23$). The study results indicated that the majority of faculty (84.7%; $n = 250$) accessed OA content, while two-thirds (64.4%; $n = 190$) of respondents reported to have used OA venues to disseminate their research materials.

There was a significant relationship between technical skills (posting research output on the Internet and creation of a personal website), professional rank, and age and the behavioural usage of OA (see Table 4, 5 and 6). However, there were no significant differences on the behavioural usage of open access by gender and research discipline. Further, the numbers of cases in Table 4, 5 and 6 are varied because some respondents did not respond to all questions.

In our study, there was a significant relationship between age ($\chi^2 = 14.717$, $P = 0.005$) and the behavioural usage of OA (see Table 4). However, the effect size was small (Cramer's V = 0.223).

There was a significant relationship between professional rank ($\chi^2 = 21.727$, $P = 0.001$, Cramer's V = 0.271) and the behavioural usage of OA (see Table 5).

The findings indicated that there was a significant relationship between technical skills (posting research output on the Internet ($\chi^2 = 39.406$, $P = 0.000$), and creation of a personal website ($\chi^2 = 35.712$, $P = 0.000$), age ($\chi^2 = 14.717$, $P = 0.005$) and the behavioural usage of OA (see Table 6). The faculty's technical skills, in particular posting research outputs on the Internet and creation of a personal website, had a larger relationship (Cramer's V = 0.369 and Cramer's V = 0.350) to the behavioural usage of OA, more than the effect of faculty's professional rank and age.

Percentage of faculty work produced in the last 5 years that have been made publicly accessible on the Internet

The study findings indicated that a small proportion of faculty's research materials was made available in OA venues in the last 5 years. In general, faculty had published not more than 38.9% ($n = 74$) of their journal articles, and they had self-archived not more than 26.8% ($n = 51$) of their book chapters in the last five years (see Table 7). The findings show that faculty are engaged in OA journal publishing more than in self-archiving practices.

The findings indicate that most respondents supported the OA approaches to research outputs, with a score of (51.7%; $n = 149$) and (34.4%; $n = 99$) in the 'strongly agree' and 'agree' categories. Three quarters of faculty members indicated that they intend to use OA frequently in the near future, with a score of 41.5% ($n = 117$) and 37.9% ($n = 107$) in the 'strongly agree' and 'agree'

Table 4 Relationship between age and faculty's behavioural usage of OA

	OA usage n (%)	Chi-square test value (χ^2)	Sample size (N)	Cramer's V value	P value
Age					
30 years and below	9 (3.1%)	14.717	295	0.223	**0.005**
31–40	59 (20%)				
41–50	79 (26.8%)				
51–60	41 (13.9%)				
61 and above	2 (7%)				

Bold values indicates the significant P-values.

Table 5 Relationship between professional rank and faculty's behavioural usage of OA

	OA usage n (%)	Chi-square test value (χ^2)	Sample size (N)	Cramer's V value	P value
Professional rank					
Tutorial assistant	16 (5.4%)	21.727	295	0.271	**0.001**
Assistant lecturer	34 (11.5%)				
Lecturer	49 (16.6%)				
Senior lecturer	60 (20.3%)				
Associate professor	20 (6.8%)				
Professor	11 (3.7%)				

Bold values indicates the significant P-values.

categories. Most faculty members further considered the establishment of repositories important, accounting for 40.8% (n = 116) and (29.2% (n = 83) in the 'very important' and 'important' categories, respectively.

Barriers to OA scholarly communication adoption

The top three of major barrier towards OA publishing as mentioned by the respondents are slow Internet connectivity, lack of awareness and inadequate skills (see Table 8).

In the interviews, librarians also mentioned slow Internet connectivity as a major problem inhibiting OA publishing by faculty. Other problems that were identified by librarians include: lack of skills and time among academics; inadequate number of library staff; lack of awareness about OA issues, such as copyright management issues; frequent electrical cuts; lack of coordination between library and research and publication unit; and perceived low status of librarians. For instance, one respondent indicated that 'most researchers tend to look down on us and do not consider a library as a

centre of scholarly information management, and thus, they tend to delay to submit their research reports to the library'. Fear of plagiarism was also another factor that inhibited faculty to adopt OA. For instance, one respondent said that 'OA is important in enabling free access to research outputs from our university; however, students tend to misuse these research reports by copying the OA content without acknowledging the source'.

The perceived roles of librarians in fostering adoption and use of OA in health sciences universities

The interviews with librarians revealed that inclusion of links to OA content on a library website (75%, n = 12) was perceived as a major role of librarians in fostering OA adoption in their institutions. For the other roles, see Table 9.

Discussion of study findings

The study findings demonstrated that OA adoption in the surveyed institutions was very low. Only one institution had established an IR, while

Table 6 Relationship between technical skills and faculty's behavioural usage of OA

	OA usage n (%)	Chi-square test value (χ^2)	Sample size (N)	Cramer's V value	P value
Using spread sheet or database program					
No knowledge	25 (8.9)	3.735	291	0.113	0.443
Less knowledge	29 (10)				
Average	35 (12)				
Knowledgeable	53 (18.2)				
Expert user	46 (15.8)				
Send and receive emails					
No knowledge	6 (2.1)	9.678	291	0.182	**0.046**
Less knowledge	9 (3.1)				
Average	7 (2.4)				
Knowledgeable	45 (15.5)				
Expert user	122 (41.9)				
Searching information on the Internet					
No knowledge	11 (3.8)	3.889	290	0.116	0.421
Less knowledge	10 (3.4)				
Average	19 (6.6)				
Knowledgeable	55 (19)				
Expert user	93 (32.1)				
Posting research outputs on the Internet					
No knowledge	35 (12.1)	39.406	290	0.369	**0.000**
Less knowledge	18 (6.2)				
Average	41 (14.1)				
Knowledgeable	42 (14.5)				
Expert user	52 (17.9)				
Creation of a personal website					
No knowledge	78 (26.8)	35.712	291	0.350	**0.000**
Less knowledge	13.7 (40)				
Average	28 (9.6)				
Knowledgeable	22 (7.6)				
Expert user	21 (7.2)				
Using word processing program					
No knowledge	14 (4.8)	12.715	291	0.209	**0.013**
Less knowledge	6 (2.1)				
Average	15 (5.2)				
Knowledgeable	49 (16.8)				
Expert user	105 (36.1)				

Bold values indicates the significant P-values.

another institution hosted an OA journal. Despite the low level of OA adoption, the findings from faculty's survey revealed that most faculty members were familiar with general OA issues, which was similar to previous studies conducted in Africa and elsewhere[2,5,8–10].

Similar to prior studies[5,30], most faculty members predominantly used OA venues to access information more than to disseminate their research materials. In the last 5 years, a small proportion of faculty's research materials was made available in OA venues. The low adoption of OA journal publishing and self-archiving practices are largely attributed to weak facilitating conditions: only one institution had established an IR and only one other institution hosted an OA journal.

Individual characteristics (that is, technical skills, professional rank and age) were found to play a great role in influencing faculty participation in OA scholarly communication. The study findings revealed that senior faculty with proficient technical skills are more likely to use OA than those faculty members at the lower professional levels. The results corroborate with the earlier findings that

Table 7 Percentage of faculty work produced in the last 5 years that have been made publicly accessible on the Internet (N = 190)

	None		1–25%		26–50%		51–75%		76–10%	
	n	%	n	%	n	%	n	%	n	%
Journal articles	57	30.0	25	13.2	34	17.9	50	26.3	24	12.6
Book chapters	77	40.5	22	11.6	40	21.1	34	17.9	17	8.9
Publishers PDF versions of refereed articles	76	40.0	30	15.8	37	19.5	31	16.3	16	8.4
Post-print	96	50.5	28	14.7	31	16.3	20	10.5	15	7.9
Data sets	114	60.0	19	10	17	8.9	25	13.2	15	7.9
Un-refereed articles	87	45.8	32	16.8	31	16.3	28	14.7	12	6.3
Books	100	52.6	22	11.6	27	14.2	29	15.3	12	6.3
Pre-print, pre-refereed	100	52.6	20	10.5	36	18.9	23	12.1	11	5.8

Researchers' perceptions on institutional OA repositories.

Table 8 Challenges for OA scholarly communication adoption from faculty's perspectives (N = 264)

	n	%
Slow internet connectivity	177	67.0
Not familiar with OA	154	58.3
Inadequate skills to publish in OA	141	53.4
Lack of reliable electricity	124	47.0
Some OA journals require authors to pay publishing costs	121	45.8
Fear to violate publishers copyright policies	112	42.4
Lack of access to a computer	103	39.0
OA publications are likely to be misused or plagiarised	103	39.0
Lack of time to publish in OA venues	97	36.7
Inadequate funds to conduct research and publish my outputs	90	34.1
My contribution to IR does not count towards my tenure/promotion	80	30.3
OA is not compatible with existing scholarly communication practice	65	24.6
OA journals are not peer-reviewed	63	23.9
Lack of mandatory policies for depositing in OA venues	60	22.7
Long-term availability of OA content is not guaranteed	53	20.1

Multiple responses were allowed.

senior faculty are more likely to participate in OA scholarly communications than younger ones[5,31]. In addition, other studies have reported significant disciplinary differences in self-archiving practices[11,13,31,32]. This study only surveyed health sciences faculty members and could find no further significant differences in terms of OA usage across the different subdisciplines in the health sciences.

Faculty were positive and supported the OA approaches to research outputs, which was similar to the findings revealed in other studies[11,13,33]. Most respondents considered the establishment of an IR important. Although the adoption of OA was low, most faculty members were willing to participate in self-archiving practices.

In our study, faculty felt major constraints to using OA venues were related to poor ICT infrastructure, lack of awareness about OA issues, lack of online publishing skills, author-pay model and researcher's fears and misconceptions about publishers' copyright issues and plagiarism. It was also evident from the interviews with librarians that slow Internet connectivity, lack of skills, time, and awareness, frequent electrical power cuts, and fear of plagiarism were major problems inhibiting faculty to publish and disseminate their research outputs in the OA venues. These findings are consistent with those reported by previous studies[5,22,23]. Most faculty members are not aware about the CC-BY licence that allows anyone to copy, edit, reuse and distribute the OA publications. After 10 years of launching a worldwide campaign for open access (OA), Budapest Open Access Initiative released another statement that recommends the use of 'CC-BY or an equivalent licence as the optimal licence for the publication, distribution, use and reuse of scholarly work'[24]. Most researchers are not aware that a growing number of publishers allow archiving of pre- or post-print articles into repositories prior to their publication. Authors are not familiar with the Sherpa/RoMEO service that provides researchers

Table 9 Perceived librarian's roles in OA environment (percentages from strongly agree and agree only) (*N* = 16)

Librarians roles in fostering OA	No	%
Include links to OA content on library websites	12	75.0
Seek external funding to finance OA projects	10	62.5
Create professional positions whose main duties concern OA issues and projects	10	62.5
Replace exorbitantly priced journals with comparable OA	10	62.5
Educate faculty about OA and copyright issues related to the faculty's publications	10	62.5
Include bibliographic records for OA content in the library catalogues	10	62.5
Help develop impact measurement tools (such as journal impact factors) for OA journals	10	62.5
Reallocate existing resources to support the development of OA projects	10	62.5
Provide financial resources to support OA	9	56.3
Encourage faculty to publish their research in OA, peer-reviewed journals	9	56.3
Encourage campus administration to adopt tenure and promotion policies that support a faculty member decision to publish in OA journals	9	56.3
Educate campus administration about OA	8	50.0
Encourage faculty to submit pre-published versions of their research to OA venues	8	50.0
Discuss resistance with users and talk about the positive impact of repositories	7	43.8

with information regarding publishers' self-archiving policies and the permissions they grant to authors to disseminate different versions of a published article[17]. For the OA to have an effect in Africa, challenges related to technological infrastructure, policies, awareness, skills and coordination of library and other units at the institution need to be addressed first.

Similar to prior research[6], the study findings indicated that few librarians were engaged with OA activities, such as monitoring Internet sites and reading literature that discuss OA issues, and discuss OA with other librarians at campuses outside their own. Most librarians did not discuss OA issues with other librarians or faculty within their institutions. Inadequate level of awareness may have contributed to the low rate of engagement with OA activities. It was evident from the interviews with librarians that there was a strong support for new roles of librarians in OA environment, which is also similar to the results revealed in other studies[6]. Thus, the librarians' strong support for various OA-related tasks did not translate into actual implementation of OA activities.

Research limitations

This study is part of a larger study that assesses the OA adoption and use of faculty and librarians in health sciences universities in Tanzania. This paper focused solely on the awareness, utilisation,

barriers and perceptions of health sciences faculty and librarians on OA. The factors that affect OA behaviour of faculty and librarians, and the construction of a model for it[34] is not part of this paper. Although previous studies[35] assessed the self-archiving behaviour of faculty by searching and extracting depositors' data from institutional and discipline repositories, this study assessed the actual use of OA venues by depending on faculty members and librarians to self-report. Unlike previous studies[2,5,9,15] that assessed use of OA among faculty from various disciplines, this study focused on the health sciences discipline to ascertain the factors that enhance utilisation of OA across the discipline. Longitudinal and mixed research studies are required to assess the faculty's self-archiving behaviour and the possibility that faculty think they published in OA journal, because they see the article for download, while actually they only see it because their institution has paid or received funded access (as institutions in a developing country).

Conclusions and recommendations

The study's findings provided the current state of OA scholarly communication in African health sciences academic institutions, with a particular focus on Tanzania. It was evident from the librarians' interviews that only one institution had established an IR, while another institution hosted

an OA journal. The findings from faculty's survey revealed that most faculty members were familiar with general OA issues. This high level of awareness did not translate into actual dissemination of faculty's research outputs through OA venues. In the last 5 years, only a small proportion of faculty's research materials was made available in OA venues. Individual traits such as professional rank, technical skills and age were found to influence OA usage. Faculty were positive and supported OA. Major barriers to OA publishing were related to poor ICT infrastructure, lack of awareness about OA issues, lack of online publishing skills, author-pay model, and researcher's fears and misconceptions about publishers' copyright issues and plagiarism. It was evident from the librarian's interviews that there was a strong support for promoting OA issues on campus, but few librarians were engaged with OA activities.

Given that the OA adoption was still low among health sciences faculty and librarians, especially the self-archiving practices, this study recommends that universities and other research institutions to consider establishing institutional repositories and mandate policies, with appropriate quality assurance measures, to improve the dissemination of research output emanating from these institutions. They should also improve the ICT infrastructure by looking into ways to increase the Internet bandwidth, access to computers and alternative sources of power. The librarians should also foster the establishment of repositories. University libraries should also promote the awareness about OA and improve information literacy skills of faculty through workshops, participation in university meetings, public lectures, print materials and electronic communication. University libraries should also provide information services that focus on OA issues, such as copyright management in order to assist researchers to understand the legal implications of self-archiving their research outputs.

Acknowledgement

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Appendix 1
Survey questions

1 Professional Position of Respondent:

1=☐ Assistant Lecturer/Researcher/Librarian 3=☐ Lecturer/Researcher/Librarian

2=☐ Senior Lecturer/Researcher/Librarian 4=☐ Associate Professor 5=☐ Professor

2 Gender: 1=☐ Male 2=☐ Female

3 Age:………………………………………………………………………………………………………..

4 Respondent Organisation:

………………………………………………………………………………………………..

5 Highest level of education: 1=☐ Bachelor's Degree 2=☐ Postgraduate Diploma 3=☐ Masters 4=☐ PhD

6 Research discipline: (e.g pharmacy, medicine)…………………………………………………

…………..

7 Rate your ability to do each of the following: (Select the appropriate number: 1= no knowledge; to 5=expert user).

a)	Use a spreadsheet or database program on a computer	1	☐	2	☐	3	☐	4	☐	5	☐
b)	Send and receive e-mail	1	☐	2	☐	3	☐	4	☐	5	☐
c)	Search for information on the Internet/World Wide Web	1	☐	2	☐	3	☐	4	☐	5	☐
d)	Publishing my research output on the Interne	1	☐	2	☐	3	☐	4	☐	5	☐
e)	Designing my personal website	1	☐	2	☐	3	☐	4	☐	5	☐
f)	Publishing on the internet even when there is no one around to show me how to do it	1	☐	2	☐	3	☐	4	☐	5	☐
g)	Use a word processing program on a computer	1	☐	2	☐	3	☐	4	☐	5	☐

8 Are you aware of OA (open access - free access to research materials for all users on the internet)? 1=☐ Yes 2=☐ No

9 Do you support OA approaches to research (i.e. free access to research materials for all users on the internet)? 1=☐ Strongly disagree 2=☐ Disagree 3=☐ undecided 4=☐ Agree 5=☐ Strongly agree

10 Have you ever made your research materials publicly accessible on any OA forums – either OA repository or journal? 1=☐ Yes 2=☐ No

11 What percentage of following your work produced in the last 5 years have you made publicly accessible on the OA venues? (Tick one box against each statement – Key: 1 = None; 2 = 1–25%; 3 =26—50%; 4 = 51–75%; 5 =75–10%).

1= Pre-print or Pre-refereed draft (research article before peer review)	1	☐	2	☐	3	☐	4	☐	5	☐
2= Post-print (ie final draft post-refereeing)	1	☐	2	☐	3	☐	4	☐	5	☐
3= Publishers' PDF versions of refereed articles	1	☐	2	☐	3	☐	4	☐	5	☐
4= Unrefereed articles (technical reports, working papers, or project reports)	1	☐	2	☐	3	☐	4	☐	5	☐
5= Journal article	1	☐	2	☐	3	☐	4	☐	5	☐
6= Book chapters	1	☐	2	☐	3	☐	4	☐	5	☐
7= Books	1	☐	2	☐	3	☐	4	☐	5	☐
8= Datasets	1	☐	2	☐	3	☐	4	☐	5	☐
9= Others…………………………..	1	☐	2	☐	3	☐	4	☐	5	☐

12 Have you used other authors' scientific works that are freely available on the Web? 1=☐ Yes 2=☐ No

13 Is it important to establish an institutional repository to improve dissemination of research outputs? 1=☐ Not very important 2=☐ Not important 3=☐ undecided 4=☐ important 5=☐ Very important

14 What factors inhibit you to disseminate your publications in OA venues? (Tick all that apply)

a) Not familiar with OA repositories and journals

b) Slow internet connectivity
c) Lack of reliable electricity
d) Lack of mandatory policies for depositing in OA venues
e) Lack of access to a computer
f) OA publications are likely to be misused or plagiarised
g) Lack of time to publish in OA outlets
h) Inadequate skills to publish in OA outlets
i) Fear to violate publishers copyright policies
j) Long-term availability of OA publications is not guaranteed
k) OA journals are not peer-reviewed and are of low quality
l) OA is not compatible with existing scholarly communication practice
m) Inadequate funds to conduct research and publish my outputs
n) Some OA journals require authors to pay publishing costs
o) My contribution into institutional repository does not count toward my tenure and promotion