



RESEARCH ARTICLE

Enablers of gender equitable scientific career progression in Sub-Saharan Africa: Insights from the DELTAS Africa Initiative

[version 1; peer review: awaiting peer review]

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Abstract

Background: This paper present findings on current strategies utilised within selected Developing Excellence in Leadership, Training and Science in Africa' (DELTAS Africa) consortia to promote gender equitable scientific career progression for researchers, as well as participants' recommendations for change. Findings are drawn from a wider research study nested within this health-based scientific research capacity strengthening initiative that was aimed at gaining an in-depth understanding of the barriers and enablers of gender equitable scientific career progression for researchers in Sub-Saharan Africa.

Methods: We adopted an exploratory qualitative cross-sectional study design. The main method of data collection was in-depth interviews (IDIs) with trainees/research fellows at various career stages affiliated to three purposively selected DELTAS Africa Research Consortia. In addition, key informant interviews (KIIIs) with consortia research leaders/directors, co-investigators, and management team were also conducted to corroborate information gathered from the IDIs, and to provide additional insights on the enabling factors/actions and policy processes that were currently in place or proposed to enhance gender equitable career progression. In total, fifty-eight IDIs (32 female and 26 male) and twenty KIIIs (4 female and 16 male) were conducted. Interviews were carried out between May and December 2018 in English. Data were analysed inductively based on emergent themes, and aligned to the developed integrated conceptual framework.

Results: Three overarching themes were identified. First: micro level efforts - individual coping mechanisms and familial level support. Second: Meso level efforts -existing enabling mechanisms at the institutional level. Third: proposed solutions for positive change

towards enhancing gender equitable career progression at micro, meso and macro levels.

Conclusions: These findings have implications for future research capacity strengthening programming, including DELTAS Africa II initiative (2021-2025); they provide valuable insights on potential strategies and actions aiming to narrow gender inequities in scientific career progression in the context of sub-Saharan African research institutions.

Keywords

Researchers' lived experiences; enabling mechanisms; gender equity, scientific career progression, Sub-saharan Africa, DELTAS Africa, Health research capacity strengthening

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Introduction

Gender inequitable scientific career progression is a global problem (The Royal Society, 2011), which has been extensively investigated in the global north, with existing literature providing little comparative evidence from the global south (Campion & Shrum, 2004). Consequently, most strategies proposed to address this issue are grounded in the socio-cultural context of countries of the global north, which are limited in capturing the nuances of gender and culture of higher education and research institutions in developing countries, and African countries in particular (Mabokela & Mlambo, 2015). Therefore, urgent attention should be paid to conducting research on higher education and research institutions in Africa in order to inform responsive policies and programs that enhance gender equitable career progression (FAWE, 2015). This should provide up-to date evidence on which to develop targeted interventions to address the needs of female and male researchers (FAWE, 2015). A recent review found a dearth of studies trialling interventions to address impediments to equitable scientific and academic career progression of female and male researchers in sub-Saharan Africa (SSA) (Liani *et al.*, 2020).

To address the dearth of empirical research into gender equitable scientific career progression in a SSA context, we undertook a qualitative research study set within the context of 'Developing Excellence in Leadership, Training and Science in Africa' (DELTAS Africa) – a health-based scientific research capacity strengthening initiative – to explore barriers and enablers to gender equitable scientific career progression. The ultimate goal of this qualitative study was to produce evidence from a holistic, gender comparative and intersectional perspective that could be used to develop strategies to promote career equity for internationally competitive African scientific researchers. In two previous papers, we presented empirical findings highlighting differential drivers of gender inequitable scientific career progression comprising of familial and socio-cultural (Liani *et al.*, *in press*), as well as institutional level drivers (Liani *et al.*, *forthcoming*). Specifically, findings presented previously illuminate how social power relations, gender norms, expectations, roles and responsibilities affect gender equitable scientific career progression across multiple levels – from the individual level, within family, society and institutions. In this third paper, we present and discuss findings on support mechanisms and coping strategies utilised by women and men researchers, existing enabling mechanisms at institutional level for enhancing gender equitable career progression, and participants' own recommendations for positive change in policy and practice. These findings could be used by institutional and consortia research leaders, principal investigators, and funders to inform programme planning for DELTAS II (2021–2025), and related research capacity strengthening initiatives, as they provide valuable insights on what strategies and actions they could tap on and implement in narrowing barriers to gender equitable scientific career progression. We frame our findings based on emergent themes from the data whilst aligning them to our integrated conceptual framework for understanding intersecting gender inequities in academic scientific career progression in SSA (Liani *et al.*, 2020), as a lens for analysing the existing

enabling mechanisms at the micro, meso and macro levels, as presented in Figure 1 below:

Methods

Study design and setting

We adopted an exploratory qualitative cross-sectional study design. The research was conducted within the context of the DELTAS Africa initiative, and implemented by a network of eleven African-led health research programmes, commonly referred to as DELTAS Africa Research Consortia (DELTAS ARC). This was a five-year (2015–2020) initiative whose vision was to train and develop the next generation of internationally competitive African health researchers and research leaders while fostering career pathways (Kay, 2015). The DELTAS ARC offered collaborative research training programmes in various health-related scientific disciplines, in a range of biomedical and social sciences, spanning 54 lead and partner institutions (research organisations and universities) across SSA, in partnership with Northern academic institutions. In doing so, it facilitated career development of postgraduate science students (Masters and Doctorate), who are both referred to in this study as junior researchers, and scientific research professionals (post-doctoral fellows and mid-level researchers), who pursued research work/studies at institutions in their home - or other African-countries.

Sampling Strategy

We adopted the principles of maximum variation sampling. This allowed us to discover patterns for core elements or dimensions that hold across a diverse sample, as well as unique or distinctive variations (Patton, 2002). We used a two-tiered purposive sampling strategy for selection of: 1) consortia and 2) participants within the sampled consortia. Step one involved purposive sampling of three DELTAS ARC. These were selected on the basis of: regional representation in SSA (Eastern Africa, Southern Africa, and West and Central Africa); representation of consortia that are located in English and French speaking countries; presence of fellows of diverse nationalities recruited from different African countries; and presence of fellows at various career stages from Masters (Msc), doctoral (PhD), post-doctoral research fellowship (PDF) and mid-career research (MCR) scientists.

For step two, we sought heterogeneity within each of the purposively sampled DELTAS ARC by using gender as a primary selection criterion for in-depth interview (IDI) study participants. Other dimensions of multiple social identities were sought along axes of career stage, scientific discipline, duration in the programme/institution, and nationality. A list containing such information was provided by the research directors of the sampled DELTAS ARC, which aided in purposive selection of study participants. Key informants were selected based on their role and knowledge about the functioning and operation of their respective DELTAS ARC.

Data collection methods

We conducted 58 IDIs (32 female and 26 male) with trainees/research fellows at various career stages supported

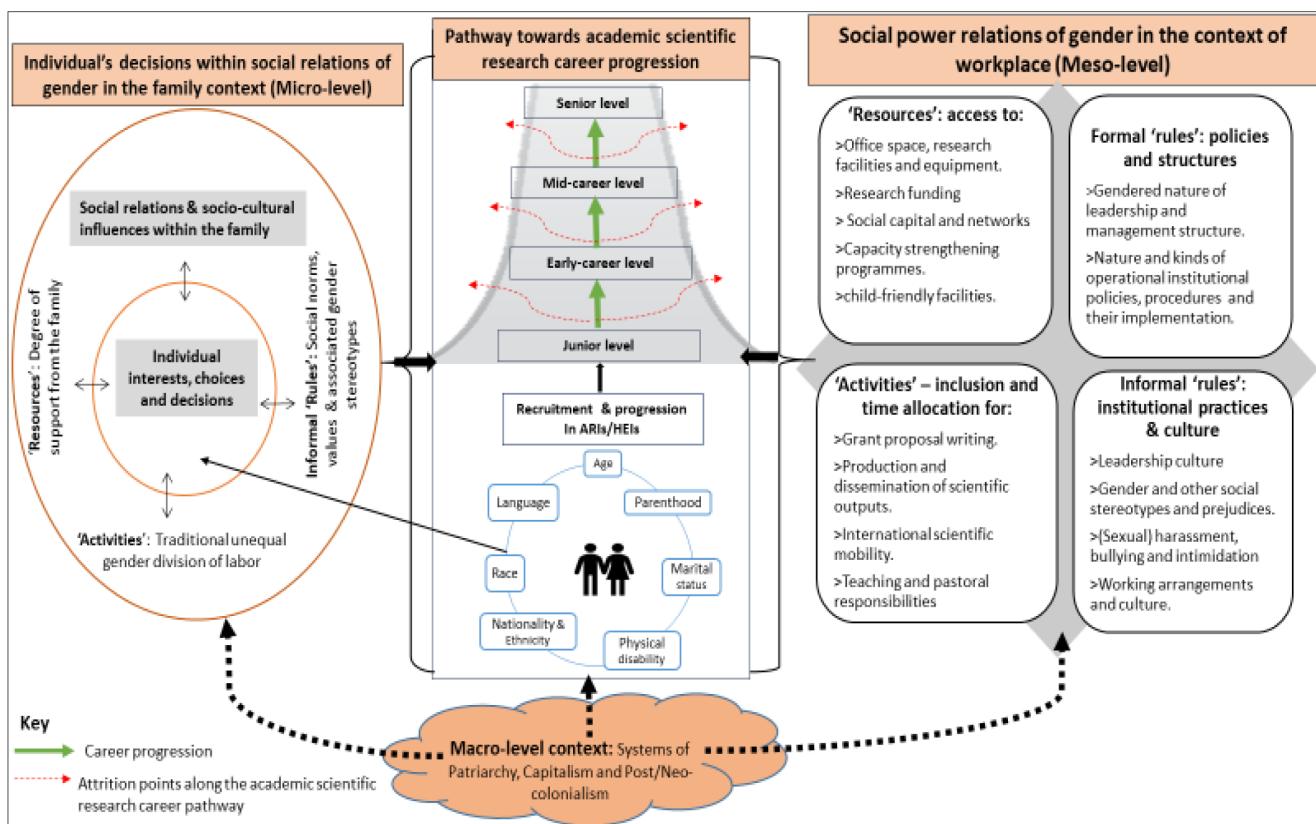


Figure 1. An integrated conceptual framework for understanding intersecting gender inequities in academic scientific research career progression in HEIs in SSA.

and/or affiliated to the DELTAS ARC. We also conducted 20 key informant interviews (KII) (four female and 16 male) with consortia research leaders/directors, programme managers/ coordinators, monitoring and evaluation officers, and supervisors (co-investigators) across the three purposively selected DELTAS ARC. IDIs were aimed at exploring qualitative narratives about the existing enabling strategies and mechanisms used to promote gender equitable scientific career progression for researchers in SSA, as well as suggestions for improvement. KII aimed to triangulate information from the IDIs and to provide additional insights on the enabling factors/actions and policy processes that were currently in place or proposed to enhance gender equitable career progression. In total, 58 IDIs (32 female and 26 male) and 20 KII (4 female and 16 male) were conducted across the three purposively selected DELTAS ARC.

Most IDIs ($n=47/58$) and KII ($15/20$) were conducted in person by the lead author (ML), a social science doctoral candidate with extensive experience in conducting interviews in qualitative research. Interviews were conducted at the respective consortia secretariat or annual scientific meeting. The setting of an interview can influence participants' engagement in the interview process and their description of their life-worlds

(Kvale & Brinkmann, 2009). We considered that participants would feel more comfortable being interviewed in an environment and at a time of their choice and that providing them this opportunity would facilitate collection of richer data. ML therefore encouraged participants to nominate an interview location and time that best suited them. As per individual participants' requests, the in-person interviews were held at times and a location that was most convenient for them, including coffee shops, meeting rooms, or researcher's offices. The remaining sixteen interviews (11 IDI, and five KII) were conducted via skype and telephone. ML requested the respective participants in advance to find a quiet place or room where they could hold a private conversation without disturbance. We created a set of open-ended questions for different cadre of participants that was used to guide the interviews.

The interviews were conducted between May and December 2018, all in English. Despite making provision for a bilingual research assistant who was fluent in writing and speaking English and French to help in conducting some interviews in French, all the Francophone study participants expressed that they were comfortable conversing in English Language as opposed to using a translator. All interviews were audio-recorded using a digital dictaphone, alongside note taking.

On average, the IDIs lasted 90 minutes while KIIs took 75 minutes.

Characteristics of the IDI sample

The IDI study participants were nationals of thirteen SSA countries across Eastern (Uganda, Kenya, Rwanda, Somali), Southern (Zambia, Botswana and South Africa), and West and Central Africa (Senegal, Ghana, Nigeria, Benin, Mali and Cameroon). They represented three consortia composed of eleven partnering institutions for which seven were research institutes and four were African public universities. The majority identified English as their everyday language of scientific communication (52/58) while the rest reported French. Overall, most study participants identified themselves as biomedical scientists (45/58) while the rest were social scientists (13/58). Regardless of gender, most study participants were from less educated family backgrounds (46/58), where no parents or siblings had attended university. Based on religious affiliation, most participants identified themselves as Christians (44/58). More female than male participants had young children and the women at early career stages were more likely to have young children than men. [Table 1](#) summarises the general socio-demographic characteristics of the IDI study participants.

A further analysis of the type of partnership for all married female and male participants showed that for the majority of relationships (24/31), only one partner, the study participant, was pursuing a scientific research career¹. For the remainder of married study participants (7/31), both partners were pursuing scientific research careers, which we refer to as dual scientific career couples, and the majority of these participants were women (5/7). Notably, both female and male participants in dual scientific career unions were at PhD (4) and PDF (3) career stage, and nearly all of them (6/7) had under five-year-old children.

Data Management and Analysis

All audio data were transcribed verbatim by an experienced qualitative research assistant. The transcripts were verified by comparing the audio files and scripts with the field notes. Once this process was complete, transcripts were sent to all individual study participants for member-checking to ensure participants' views were appropriately captured. This process also allowed the participants to identify content they preferred to be removed from the analysis e.g. individual characteristics and statements that they felt might easily identify them. Following the member checking process, most of the IDI participants asked to have the identities of their ARC and affiliated institution, number of children, country of origin, disciplinary field of study withheld for confidentiality purposes. In addition, they suggested that findings be presented as views and experiences of participating DELTAS Africa research fellows as a whole. In protecting participant anonymity and confidentiality, all identifiers have been replaced with pseudonyms. However, given the necessity of an intersectional

gender analysis, other identities such as age (provided in range), marital status, and presence of dependents are anonymously presented where necessary.

Thereafter, ML organised and coded the data in QSR International's NVivo 11 qualitative data management software, and analysed these inductively based on emergent themes, whilst aligning the themes to the developed integrated conceptual framework for understanding intersecting gender inequities in academic scientific career progression in SSA ([Liani et al., 2020](#)). ML utilised a grounded theory approach, employing constant comparative analysis ([Charmaz, 2006](#); [Glaser & Strauss, 1967](#)). All illustrative quotes have been carefully reviewed for their potential to reveal individuals' identity.

Trustworthiness of the data

As a way of minimising individual researcher bias, ML, IN and RT held regular peer debriefing sessions to discuss the coding process, interpretation and presentation of the analysed data. Moreover, based on the tradition of qualitative inquiry, we have amplified the voices and experiential realities of the African women and men scientific researchers by using participants' verbatim phrases from interviews to support our interpretations of the data. The trustworthiness of key messages was further strengthened through dissemination of key research findings by ML, a PhD student, in various fora including the DELTAS Africa Annual Grantees Meetings, conferences, seminars, symposium, and producing annual learning reports for DELTAS ARC. This was useful for feedback provision that further guided data interpretation and presentation of the findings.

Ethical considerations

The study received required approvals from the Liverpool School of Tropical Medicine Research Ethics Committee (Protocol ID: 17-075) and the Strathmore University Institutional Ethics Review Committee (Protocol ID: SU-IRB 072/18). Participants were provided with an information sheet that explained the aims of the study and related risks and benefits. All participants gave written informed consent. For participant anonymity and confidentiality, all identifiers have been replaced with pseudonyms.

Results

Three overarching themes pertaining to enabling factors for scientific career progression emerged from the data. These included: 1) individual coping mechanisms and role of familial support at micro levels; 2) existing enabling mechanisms at the meso research institutional level; and 3) proposed solutions for enhancing gender equitable career progression at micro, meso and macro -levels.

Theme 1: Micro level efforts: Individual coping mechanisms and familial level support

Individual agency, resilience, and importance of daily work-schedules

Most female and male participants commonly perceived personal characteristics such as self-awareness, determination,

¹In this study, we define such partnership as non-dual career couples.

Table 1. Socio-demographic characteristics of the IDI study participants (n=58).

Gender		Other characteristics	Total (n=58)	MSc (n=14)	PhD (n=19)	PDF (n=18)	MCR (n=7)
Women (n=32)	Age Range	25–29	9	7	2	-	-
		30–34	12	2	9	1	-
		35–39	5	-	-	2	3
		40–44	4	-	1	2	1
		45–49	2	-	-	1	1
		Total	32	9	12	6	5
	Marital status	Unmarried*	16	7	4	3	2
		Married	16	2	8	3	3
		Total	32	9	12	6	5
	With children <5 years	Unmarried (16)	4/16	0/7	0/4	2/3	2/2
		Married (16)	12/16	2/2	6/8	3/3	1/3
		Total (32)	16/32	2/9	6/12	5/6	3/5
Men (n=26)	Family educational Background**	Highly educated	8	2	2	1	3
		Less educated	24	7	10	5	2
		Total	32	9	12	6	5
	Religious Affiliation	Christian	26	8	10	3	5
		Muslim	2	-	1	1	-
		None	4	1	1	2	-
		Total	32	9	12	6	5
	Age Range	25–29	4	3	1	-	-
		30–34	8	2	3	3	-
		35–39	9	-	3	5	1
		40–44	2	-	-	2	-
		Total	26	5	7	12	2
	Marital status	Unmarried*	11	5	4	1	1
		Married	15	-	3	11	1
		Total	26	5	7	12	2
	With children <5 years	Unmarried (11)	0/11	0/5	0/4	0/1	0/1
		Married (15)	11/15	0	1/3	10/11	0/1
		Total (26)	11/26	0/5	1/7	10/12	0/2
	Family educational Background**	Highly educated	4	1	1	2	0
		Less educated	22	4	6	10	2
		Total	26	5	7	12	2
	Religious Affiliation	Christian	18	4	6	7	1
		Muslim	5	1	1	2	1
		None	3	-	-	3	-
		Total	26	5	7	12	2

Legends

*The label 'unmarried' includes those who identified themselves as single (never married), divorced or separated. We grouped them together for purposes of protecting participants' anonymity and confidentiality particularly for the latter two identities.

** We based this on the parental and sibling's level of education, with those who had attended university considered as highly educated.

hard work and resilience as enablers, at micro level, of career progression. For example:

"One of the things I have come to discover as I journey on in science is that it has to do with passion and determination... Knowing who you are and what you want to achieve as an individual. I happen to be someone who is self-driven and self-motivated and that I have my own focus. I don't allow people's beliefs and thoughts about me to influence where I am going. I like what I am doing, working hard day by day to build my future" (IDI, Male, #12, PDF).

Some female participants expressed how they exercised their own agency through defying gender norms on early marriage to enhance their career progression in science. For example, a participant said:

"As an individual I have had my own goals. I did not want to divulge into starting a family. I know that is a rite of passage, but I was determined to achieve something more [establish career first] before I get there" (IDI, Female, #19, Msc).

Additionally, some married female participants with young children expressed how they coped with career and family life imbalance through utilisation of daily routine working schedules which enable proper planning and time management. Notably, this approach was particularly reported by those women who identified themselves as being in a dual scientific career partnership. As one of them noted:

"For me, a routine program helps especially if you have young children...I have always found out that it is very important as try to fit my work routine within their routine, so it works for me... So, I wake up early and get them ready for school... I bring my kids to school myself then go straight to office...that allows me to be at work early...that means I can leave early because I have clocked all the hours that I need. That means I catch my children early in time to do their homework with them, cook dinner and ensure they are in bed by 8pm. Then I continue working until maybe 11pm, yeah and then I will go to bed and I will wake up at 5am to repeat it all over again. So, on weekends, I try not to work, unless when I have deadlines... So, I think having a schedule that works maybe propagates more productivity... of course other mothers might have a different opinion" (IDI, Female, #26, PDF, married, under 5-year-old child, dual scientific career couple).

The role of religious faith

This was commonly perceived by some female and male participants, particularly by those who identified themselves as Christians and coming from disadvantaged family backgrounds as useful for coping with the situation of uncertainty with research funding and limited career progression opportunities as detailed in a different paper ([Liani et al., forthcoming](#)). The comfort they found in religious faith often provided a

platform for resilience and determination as they pursue their scientific research career. For example:

"I feel like having a Christian background allows me to deal with difficult situations and struggles you go through with life or even uncertainty with future on what will happen after my current grant is finished, all of those uncertainties that are part of science...the knowledge that I have a God that is faithful helps me sail through in my career..." (IDI, Female, #32, MCR).

"I happen to come from a very poor home. My mum is just a petty trader, and my father was a businessman although he died long time ago... finishing my Bachelors' degree was difficult...my mum was unable to meet my basic needs. So, I had to be working alongside studying doing some petty work like laundry to raise money for upkeep and clear my school fees. It was a bit tedious for me... I really thank God because he has and keeps helping me to skate through all those difficult phases in my life...right now I am a scientist and at the same time I am a Christian, I love God. I believe if I work hard and faithfully, God will reward my career path" (IDI, Male, #08, PhD).

Familial and spousal support

Participants of both genders commonly reflected on the importance of moral support and encouragement, as well as practical support such as with childcare needs provided by parents, siblings, extended families, and spouses as enablers for scientific research career progression. Family and spousal support with childcare was mainly reported by some female participants with young children who perceived it as instrumental to managing the substantial demands of scientific mobility. This was linked to the expectation that children are women's responsibility as presented in a different paper ([Liani et al., in press](#)). This was illustrated using the following excerpt:

"The support from my spouse [non-dual career partner] was critical for me to pursue my post doc in another country by allowing me to be away from home for two years. He offered me moral support and took care of our two children (all under 5 years old) with the help of my mother in-law. Most of the time, my children were with my husband...He has been very supportive in my career...this cannot work for every woman. It is difficult to get a supportive African spouse. I am just lucky" (IDI, Female, #06, PDF, married, non-dual career couple).

The above participant commented on her situation as being unusual by pointing out how spousal support for childcare was rare. Moreover, some doctoral female research fellows in dual scientific career partnership reported receiving help with scientific writing from their spouses. They stressed that this support was a major enabler for their career progression, as exemplified by the following quote:

"I also get support from my husband... he is there for me.... every time he is up to date with what I am doing. Of course, when I'm preparing grant or fellowship applications or writing my work, he helps with proof-reading and making necessary changes to ensure that it is well written. I mean he is there to materially, morally and socially support me" (IDI, Female, #12, PhD, Dual scientific career couple).

Theme 2: Meso level efforts: Existing enabling mechanisms at the institutional level

Good mentorship and supervision as critical for scientific career progression

In general, most female and male participants at all career stages reflected positively on career support received through good mentorship and supervision. Commonly identified benefits included: access to information around career progression and funding opportunities; support with preparing grant applications; fostering exposure and visibility through professional networking and research collaborations. For instance, a participant said that:

"For me, mentorship support and good supervision have been a very big one! Without it, I don't think I could be where I am now. I really appreciate my supervisor who is very keen into ensuring that I fit into the organisation pretty easy, and he is a good mentor. I was able to know what I wanted to do in my next, like in 3 years' time, I knew I wanted to do a PhD in this field, and it is through his mentorship and supervision that I was able to win the DELTAS Fellowship. So, he has been very instrumental into my career progression... helping network with other people...he is the one who taught me how to do literature reviews and how to critique papers. For me that is mentorship which cuts across different layers...I must mention that he was extremely critical in my decision to stay in science because of the mentorship support, the pastoral discussion around the opportunities that I could pursue after my PhD" (IDI, Female, #25, PDF).

Even though participants were aware of the difference between supervision and mentorship, most of them observed that they had one person playing both roles which had enabled them to progress to their career level, pointing to their supervisors as mentors. However, the paucity of psycho-social mentorship was an issue for women researchers as described in another paper ([Liani et al., forthcoming](#)). Participants stated that multiple types of mentors were required to serve various needs that ranged from career guidance and advice to psychosocial support, with the latter support particularly lacking as reported by most women from two sampled consortia. In contrast, in one consortium, both KIIs and junior researchers reported provision of psycho-social support through its formal mentoring programme for doctoral research fellows, known as the 'Studentship Monitoring and Advisory Committee' (SMAC), which was independent from the student's supervisory

team. The SMAC included a third-party monitor, commonly referred to as 3PM person, to help deal with pastoral and personal life issues as exemplified using the following excerpt:

"We have a formal structure for mentorship within the program where every PhD student are assigned a SMAC, which has the chair and one member then you have a third-party monitor (3 PM person) who is of the same gender like yours, who is like an independent off the student monitoring committee and off supervisors, a neutral person to get to talk to in case I have any challenges, either personal, or related to academics and it is a she....So far she has been mentoring me and also encouraging and supporting my emotional growth and wellbeing. ...she is a married woman with young children, and who is excelling in science. So she has been able to share with me her experiences, challenges and also pieces of advice in terms of trying to manage work and life by advising me on how to go about it... she has really been a source of support to me as I get to talk to her about any other thing apart from academics and she gets to give me pieces of advice" (IDI, Female, #23, PhD, married, under 5-year old-child).

Most participants (in all three consortia) pointed to their DELTAS consortia research directors, notably all of who were male, as natural mentors too; perceiving them as inclusive leaders passionate about enhancing career progression of women scientists:

"The late Director [male] of our institute believed in having women in science and ensuring that they excel in their careers. He used to refer to us women scientists as "Amazons of [name of institution]". To him, 'Amazon' meant female warriors in science...this really motivated us in our career paths in science...He placed us in a context where you are assured that research can be done by women. Such sentiments boost my morale to stay in science" (IDI, Female, #05, PDF).

Supporting researchers' well-being

Participants reported that the sampled DELTAS Africa consortia incorporated different approaches to supporting research fellows' wellbeing. This included: initiating regular work-life discussion fora for fellows; and having a functional wellbeing department within an institution.

One consortium strived to enhance the wellbeing of its fellows through initiating regular work-life discussion fora during annual grantees meeting and other scientific events. Such events brought together women and men senior researchers from different institutions who were married with families for insight sharing to emerging research scientists on how they managed or were managing to deal with work-life balance. Such conversations were considered instrumental for "providing fellows with options suitable to their circumstances, whether married, or looking forward to getting married" (KII, Female, #09). For instance, a participant noted:

"This is a platform where we discuss the personal issues and challenges that people are actually facing...hearing from people about what issues they have and also hearing from junior people what issues they have and trying to kind of learn from each other...that often changes people's perception because you always have the impression of so and so must be so successful, they surely can't have any problems. And then when you actually talk to them, they often have overcome a lot of challenges and still have challenges that they are battling" (IDI, Female, #13, PhD).

A research institute in another consortium, had an established and functional wellbeing department at the workplace that encouraged and supported staff to engage in physical activities as well as promoting a culture of not working on weekends. Although this was not directly linked to gender concerns, it is primarily relevant as this contributes towards addressing the challenge of the common long working hours culture of science research (*Liani et al., in press*) which has the potential to put women and men on a more level playing field at the institutional level. This was considered by fellows affiliated to this institution, as useful for achieving a work-life balance.

"We have a well-being department that is very keen to support employees with work-life balance. I have been in this institution for five years since I joined in as PhD student. They usually encourage us to undertake exercises...they pay gym for me and my family members.... We are highly encouraged not work over the weekends...They real care about our wellbeing" (IDI, Male, #05, PDF).

Support with caring responsibilities

This was reported by female and male IDI participants as well as key informants, who narrated about provision of childcare support for female researchers while traveling abroad; allocation of research assistants to women who were overwhelmed with caring responsibilities to help with data collection and analysis; as well as extension of fellowship duration for women who went on maternity leave.

Most key informants across the three sampled consortia stated that there was no budgetary allocation for childcare support for female researchers while traveling abroad, as they did not include it in their DELTAS Africa funding proposal. However, they made efforts to support such fellows through provision of subsidies for child-care while on scientific travel, which was done on a case-by-case basis, dependent on available funding. In dealing with budgetary challenge for childcare support, one consortium embarked on establishing the needs of its fellows and supervisors through the collection of gender and diversity data, which supported a successful funding application for a childcare grant. With a dedicated gender budget, they provided proper targeted support through provision of child-care support for fellows and supervisors through sponsoring the baby and nanny while on engaging in scientific

mobility. The following quote illustrates how a female participant benefitted from such an initiative:

"[Name of consortium withheld] has been working towards supporting us with childcare when you travel... they sent us emails asking if we needed childcare support and facilities for the upcoming annual meeting which was happening in Rwanda. So personally, I have a 10-month-old baby for which I took advantage of it by responding to the email... When that time came, I carried along my baby and the nanny. They catered for all my travel cost...I was booked in a hotel with a double room, so the nanny had her own room... I was given an allowance that was enough to cater for all of them for the three days we were at the meeting...This made my life easier as I concentrated at the meeting and could pop into the hotel room to breastfeed the baby" (IDI, Female, #13, PhD, married, under 5-year-old-child).

To help overcome the challenge of family and caring demands, some female participants from one consortium reported that they had been supported by a sympathetic research director who allocated them research assistants to help with data collection and analysis. For instance, a participant stated:

"I got my two children while doing my PhD here... I remember I had my first born who was six months and I was supposed to go abroad for one-month lab work...our director was very sympathetic and understanding. He sent someone there to do the lab work for me and I just analysed my data here...when I had the second baby, he again assigned me a research assistant to help with data collection in the field. This enabled me to finish my PhD in time" (IDI, Female, #06, PDF, married, under-5-year-old children).

Across all the sampled consortia, most female participants who went on maternity leave indicated that they were granted a fellowship extension for the duration they were away from work/studies through support from their immediate supervisors. Overall, most key informants agreed to this; for example: *"I think the best thing to do is to really be supportive... I recently requested for a three-month extension with full stipend payment for my PhD student who was recently on maternity leave, and this was granted" (KII, Male, #01).*

Theme 3: Proposed solutions at micro, meso and macro levels

Our study participants made various suggestions and recommendations for enhancing gender equitable scientific career progression in Africa, while noting that: *"we still have a long way to go" (IDI, Male, #24, PDF)*. This theme presents participants own proposed solutions pertaining to the desired actions for positive change aimed at the micro individual and societal level; meso institutional and consortia level; and macro programme-wide and funding level contexts.

Micro level actions for individual researchers and society

Most early and mid-career female and male researchers cited the need for junior researchers to disclose the career progression challenges they face. Specifically, they noted that some junior female researchers were not confident enough to share what was troubling them, as some could even hide pregnancy, which may be detrimental for their health and safety.

"Two years ago, I had a Masters' Fellow who came in while pregnant but didn't mention that she was expectant at that point. Unfortunately, I came to know about it much later as one day towards the last four months, she came to work and then she collapsed...That is when I realised, she was pregnant as it was not visible...as a clinical scientist, my conclusions were that maybe working with chemical in the lab is what affected her...perhaps that is something if she had mentioned earlier, as her supervisor, I could have adjusted her work schedule for her own health and safety. At that early phase, there are chemicals that you shouldn't be exposed to and we can adjust your schedule and project to suit such scenarios of your needs at that point" (IDI, Male, #24, PDF).

"In most instances the younger women Masters' Fellows just don't ask if they are entitled for maternity leave while on fellowship...they should ask other women who have been there what should I do if I get pregnant...even ask your supervisor, ask widely, talk widely. There are other people you could approach, and ask what would be the best scenario for me while in this situation?" (IDI, Female, #28, MCR).

Some female and male participants identified the need to create community and public awareness on the importance of what research scientists do to garner familial support. They highlighted that this should be particularly about the nature of science that requires long working hours and frequent scientific mobility, for which women researchers tend to be more disadvantaged based on their reproductive gender roles compared to the men. Indeed, the identified need to create community and public awareness on what research scientists do was demonstrated after the formal data collection period by some DELTAS fellows through the provision of a gender equity community and public engagement fund². This was specifically aimed at supporting implementation of engagement project activities that contribute to the gender equity agenda in science research such as carrying out advocacy to attract more African women in science careers.

Meso level actions for institutions and research consortia

Various suggestions were provided which ranged from the need to: build and nurture a supportive research community; commitment to create supportive and inclusive gender sensitive work environment; a formal and structured approach to

mentoring for all research fellows; and improvement on gender balance in scientific leadership positions.

Need to build and nurture a supportive research community: This suggestion was cited by most early career and mid-level female researchers, and was not mentioned by male participants and KIIs. This included the need to launching fora within institutions that encourage open dialogues for researchers to discuss and provide mutual support around career progression challenges, career decisions and work-life balance issues. *"We need to start creating an environment where conversation replaces silence...where people with families can share their experiences. Dialogues about career decisions and work-life balance" (IDI, Female, #26, PDF).* This was perceived as *"small intangible things can make a huge difference in fostering peer to peer mentoring" (IDI, Female, #27, PDF).*

They further reiterated that institutional and programme leaders develop a culture of 'catching up' with researchers to find out their needs and discuss how best they can be supported, as exemplified in the quote below:

"Honestly, the program should talk to us more. I think there just needs to be communication... that needs to be embedded within the institutional culture. The directors need to talk to scientists just 'catching up' with them to know what is going on with you? How can we support you better? ... you cannot manage a group of scientists without doing that... You cannot second guess scientists needs...instead you have to deliberately sit down with me to find out what my challenges are...that is absolutely key, and sadly it is lacking here" (IDI, Female, #31, MCR).

Need for commitment to create supportive and inclusive gender sensitive work environment: Most IDI participants and key informants identified various actions for policy and practice changes towards making the workplace environment conducive and enabling for all. They highlighted the need to establish and implement formal standard operating procedures (SOPs) at consortium level on how to report and handle harassment and bullying, which was particularly reported by female researchers as discussed in a previous paper (*Liani et al., forthcoming*), as well as improvement on communication of such policies. At the consortium level, the key informants asserted that they did not have SOPs in place to deal with issues around harassment, bullying and intimidation. Indeed, some suggested that going forward, it could be useful if DELTAS supported institutions and consortia establish an independent external mediation council to help resolve such matters.

"We don't have written policies for the consortium...but going forward as a network, we need to develop formalised SOPs or guidelines for [name of consortium with-held] on how to report and deal with sexual harassment, bullying and intimidation of fellows at workplace...and maybe what we could also do is to put together like a board of mediators within the network or outside the network for handling such issues" (KII, Male, #08).

²<https://mesh.tghn.org/articles/guide-evaluating-engagement-seed-funding/>

In the same vein, the need for provision of routine training and coaching to scientists and faculty staff on how to identify and deal with unconscious biases at workplace was also highlighted. In addition, an informant reiterated that: “*There is need to encourage women to be less acceptive of biases, generally men can be very aggressive than women*” (KII, Male, #14). Moreover, participants identified the need for confidential periodic review of fellows’ experiences with their work environment. They also suggested the need to support strategic programmes within institutions that encourage gender equity, for instance through rolling out online campaigns on websites inquiring “*what is your institution doing to enhance gender equity at workplace?*” (IDI, Male, #17, MSc).

Most female and male participants identified the need to support the well-being of all researchers through promoting family-friendly policies and practices within institutions. They asserted that even though the practice of provision of flexible work arrangement based on supervisory agreement was granted to some fellows, as described in a different paper ([Liani et al., forthcoming](#)), they proposed the need to develop formal policy or SOPs on provision of flexi-time to all research fellows. Nonetheless, to help alleviate the challenge of caregiving obligations, they highlighted the need for creating a more gender sensitive institutional environment favourable for all through provision of childcare support and mother and baby friendly facilities at the workplace. This was summed up by a participant using the following excerpt:

“I would like to see a favourable work environment, flexible timelines and support particularly women in science, for which I think that would be exemplary. I would want to in a situation where a woman can choose to pursue her career without necessarily feeling like they have to give up with family and childcare...the same thing for men, if they choose to have their families you don't have to give up... we need to work towards an environment where you can go to a conference presentation because you know that there is support for childcare” (IDI, Male, #25, PDF, married, dual career couple, under five-year-old child).

Similarly, most key informants agreed with this; for example:

“We need to give women an enabling environment for them to progress career wise by setting up mother and baby friendly, and day-care facilities at workplace to address the push factors and trigger a pull factor for women to be retained in scientific careers” (KII, Male, #16).

In one consortium, the lead partner institution had already initiated conversations about how to establish a crèche at workplace:

“Childcare provision at work is one of those things that I really think should be introduced. We have started discussing it at the secretariat to see even if we can apply for funding to introduce a crèche where students, researchers or even other employees

can pay some minimal fee and just bring their kids and can check on them like every two hours” (KII, Male, #12).

Indeed, some female participants recommended improving communication on such provisions in fellowship and job advertisements by advertising anticipated support besides the common declaration that ‘female candidates are highly encouraged to apply’:

“Declaring that women are highly encouraged to apply in adverts doesn't really count a lot. At the end of the call for applicants to fellowships, they should declare that they have childcare provision for women travelling with young children. That doesn't happen!” (IDI, Female, #03, PhD, married, under five-year-old child).

A key informant alluded to this noting that:

“In the next call for DELTAS II, we will specify in the advert that we have different opportunities to support female fellows such as provision of maternity leave, prolonging the duration of completion of the fellowship, and support for childcare. It seems that most female fellows would shy away from applying if they are waiting for a baby or have young children to take care of” (KII, Male, #15).

Need for formal and structured approach to mentoring for all research fellows: Most key informants expressed the need for “*a more structured and reliable way to mentorship*” (KII, Male, #13), noting that most often, “*we tend to merge the roles of mentorship, supervision and role modelling into one, which should not be the case*” (KII, Male, #20). This was perceived as an important consideration for the next phase of DELTAS Africa Initiative.

“We don't have a formal mentorship scheme for all fellows. One of our plan for the future is to have an official structure where we assign mentors for PhD fellows as we do for our and post docs... that is something that is to be considered for the next phase of DELTAS II going forward which I think would be helpful... it would be nice to also have an external mentor which is something I had while in [United Kingdom academic institution], having someone randomly from the university assigned to help you with non-scientific issues” (KII, Male, #13).

In doing so, they highlighted the need for provision of both career & psycho-social mentoring for fellows, which was viewed as crucial for career progression. “*In DELTAS II, we plan to improve on this aspect of mentorship by providing fellows with career and psycho-social mentors*” (KII, Male, #06). Additionally, participants expressed the importance of mentor- mentee matching on the basis of disciplinary training background; social background and gender as exemplified using the following quotes:

“Mentorship shouldn't just focus on the science alone. We need to also know the personal background

and environment in which of our mentors grew in. We can feel motivated if you are able to identify easily with your mentor...Sometimes it is difficult to easily interact with a mentor whose scientific field of study is different from yours...disciplinary matching of mentor and mentee is necessary" (IDI, Male, #24, PDF).

"As a mentee, you need someone who understands your research background, social and life experiences. The mentorship process needs to be natural, and not just on scientific focus... so the mentorship you get from a male is different. Sometimes they are things you feel you can't easily share with a male mentor... the kind of support you can get from a female mentor is somewhat different. The understanding of the experiences that is similar to yours so the challenges you may have like to balance career and family" (IDI, Female, #11, PhD).

They also pointed out the necessity of being involved in the selection of their mentors. Indeed, in one consortium, a key informant noted that in the next phase of the DELTAS Africa Initiative, a proposal had been made to have all fellows select their mentors as well as feedback provision of the mentorship process.

Improving gender balance in scientific leadership positions: This was considered necessary for enhancing gender equitable decision making on career progression matters affecting all research fellows, while noting that a greater critical mass of women leaders has the potential to reshape organisation cultures. Most female participants expressed a need for institutions to actively encourage women to take up senior scientific and leadership positions to redress gender imbalance at higher levels as exemplified using the following quote:

"I do feel we should have more female top leadership. Right now, if you look at our top leadership, all our directors are male... they are all great leaders but there should be a room for improvement at least to have a female one on board" (IDI, Female, #27, PDF).

They felt that this could be achieved through provision of mentorship, and leadership and empowerment training programmes from early career level onwards to help build confidence, resilience and support individual decision making around career progression.

Additionally, both IDI participants and key informants suggested the need for institutions to make a strategic decision to appoint more women in senior and leadership positions to serve as mentors and role models for emerging female researchers.

"We should aim to appoint a number of women in science leadership as manager and directors and also try to promote women to senior scientist positions... and provide them with personal mentorship on how to run a Research Centre or programme" (KII, Male, #06).

Notably, some informants observed that the problem of gender imbalance in leadership was sometimes reinforced by funding agencies, who mainly appoint male leaders to take oversight of the institutions they fund, citing the need to also do better in serving as change agents.

"Well, I suppose we could do better with coordination of our most senior appointments offered to women... that would be helpful. But then the funders as well have to play a role in reducing the gender disparity gap in leadership ... if you look across all the Wellcome programs in Africa, the directors are all male appointees...they need to do better from their end to serve as a good example for us, as opposed to insisting the problem needs to be fixed from our end" (KII, Female, #03).

Macro level actions at the programme-wide and funding level

Need to foster and secure the careers of female and male researchers: Both IDI participants and key informants identified various measures to help overcome the challenge of uncertainties with research funding, and limited scientific career progression opportunities, which differentially impact on women and men within institutions (Liani *et al.*, forthcoming). To begin with, they recommended that AESA (the DELTAS Africa coordinating agency in the African Academy of science), establish career centres to help with career advice as well as placement of fellows. In addition, they suggested that centres need to negotiate for memoranda of understanding with research and academic institutions in Africa for career placement opportunities for DELTAS fellows. In doing so, they also underscored the need for deliberate efforts by the coordinators of DELTAS Africa initiative to lobby for establishment of parallel career development systems within African universities based on research activities rather than teaching alone.

Secondly, most participants identified the need for provision of information to fellows about the possible career pathways available for them in their specific countries/contexts as illustrated using the following excerpt:

"Sometimes after PhD completion, you are just involved in projects that are under the responsibility of your PI without really clear yet in terms of career pathway. You get little bit confused because you don't know exactly what you want to do.... career pathways are different in each country. Maybe DELTAS could think of informing fellows of career pathways that are available in their own countries...[as they have] collaborators in all those countries who are aware of what is going on there" (IDI, Female, #21, PhD).

In the same vein, some participants emphasised the need for a rethink of alternative career pathways for researchers given the limited opportunities in the mainstream academic scientific research in Africa. Similarly, a key informant alluded to this, noting that:

"Sometimes, I think that is very important for the fellows to also have alternative career path in science given that a lot of the time is very hard for them to succeed given the culture of funding uncertainties...so we also have to capacitate our fellows to also maybe jump to industry or government, open to them a career on entrepreneurship, start-ups, innovation, management but still where science can make a big impact not just in the academics" (KII, Male, #10).

Need to develop virtual research capacity strengthening programme: This was identified by some women researchers with caring responsibilities who may not be away from their families for long. They emphasised that the DELTAS Africa initiative should accommodate their different needs and situations by embracing use of online virtual approaches. For example, a participant narrated how she had forfeited on several occasions to apply for fellowship opportunities abroad because of family commitments. Accordingly, she explained that even if provision for childcare support was accorded to her, she could not travel abroad with a nine-month-old baby or take a child out of school for three or six months for the sake of career progression. Instead, she suggested that *"DELTAS should consider embracing online capacity building programme for women who can't be away from home for long"* (IDI, Female, #06, PDF).

Support for language minorities research scientists: To help overcome the language barrier challenge experienced by Francophone speaking fellows who identified themselves as minorities in science research (Liani *et al.*, in press), such participants suggested the need for provision of translational services while attending scientific gatherings. Additionally, participants expressed the need to extend fellowships at Masters' level where consortia did not provide such opportunities to enable earlier development of English language skills as they progress to doctoral levels and above.

Need to embrace a different approach to funding: Some early career and mid-level female researchers recommended that funding agencies establish a separate competitive fund for African women in scientific research, due to the additional challenges posed by their caring responsibilities.

"They should create a kind of funding just for women, that men cannot apply for. Just make competition in between women. That will give the opportunity because they almost face similar issues... So they should give the chance to people having the same problem to compete in between them" (IDI, Female, #25, PDF).

The above participant further observed that such kind of funding approach was provided by the Organization for Women in Science for the Developing World. In addition, some early career male participants suggested the need to remove age limit for female applicants to PhD and PDF positions given the motherhood and family responsibility penalty experienced by

most women. Overall, such insights were corroborated by a key informant who said:

"What funders could do is to avail more funding which is specific for females...you find some of these sponsorships are restrictive of age. So, for the females, I would remove the age limit and then just keep it for the males. So, no age limit for female applicants and then specific number of people. Let's say maybe half should be specific for female and then they can compete for those slots...That is what I would do...because during their thirties that is when some women have children and then they can't continue with postgraduate studies. Sometimes it is difficult for them to go at PhD levels. Such an approach can enable them to plan for the family knowing that they don't have age penalty" (KII, Male, #13).

Discussion

The findings reported in this paper illustrate a range of efforts made by the individual researchers themselves alongside family support (micro level) and those of the DELTAS Africa partner institutions and consortia (meso level) towards enhancing gender equitable scientific progression. In addition, female and male participants proposed solutions in form of suggestions for actions to support gender-equitable career progression within scientific research. These were perceived as necessary for achieving positive change, which could be pursued at different levels: individual and societal (micro context), institutional and consortia (meso context), the wider programme and at funding agencies (macro context). Together, these provide useful insights on enablers of gender equitable scientific career progression of researchers in Sub-Saharan Africa.

Individual agency, family, and religious support

The coping strategies and mechanisms employed by most participants such as individual agency and resilience demonstrates what feminist scholars would characterise as use of agency to intervene, challenge, and in a modest way, to help transform their situation (Mabokela & Mlambo, 2015). Other studies from Africa have also found that women have identified family support (Mabokela & Mlambo, 2015) and religious faith, which serve as a framework for providing both reasoning about making career progression decisions (Johnson, 2014) as internal integral enablers for their professional success, aligning with our findings.

Flexible working and family friendly policies

Institutional reforms and policy changes are required to enable individual researchers to achieve sustainable transformation of the structural and systemic barriers to career advancement (FAWE, 2015; Mabokela & Mawila, 2004; Okeke *et al.*, 2017). As reported in the current study, given the lack of such changes, participants suggested the need for creating an inclusive environment through establishment of clear gendered policies and practices, which was also recommended in another study (Assié-Lumumba, 2006). The need to update workplace policies

towards implementing family-friendly policies to accommodate women's dual productive and reproductive roles has commonly been recommended in the global North (Ackers, 2004; Bates *et al.*, 2016; Goulden *et al.*, 2011; Mavriplis *et al.*, 2010), which could also be extended to SSA. For instance, Goulden and colleagues argued that researchers receive limited benefits when it comes to family responsive policies, such as paid maternity and parental leave, and that young scientists receive the least, emphasising that governments and universities should make concerted efforts in solving this systemic problem (Goulden *et al.*, 2011). Mavriplis and colleagues study findings from the USA, Canada and Australia also underlined the need to design and implement maternity and child care leave policies (Mavriplis *et al.*, 2010). In Europe, Ackers suggested that such family-friendly policies, including provision of child-care facilities at scientific conferences and workshops, should be promoted and highly advertised by institutions to encourage other universities and research institutes to examine and improve their existing policies (Ackers, 2004). In addition, increased flexibility for women and men in global health research has been recommended to accommodate personal, domestic, and family obligations, including increasing part-time opportunities and longer extensions (Dhatt *et al.*, 2017).

The need to foster institutional collaborative science research programs in Africa has also been identified as one of the key mechanism for sharing best practices globally and which is very often mutually beneficial (Okeke *et al.*, 2017). Flexible collaborative programs that offer short-term training or research abroad are seen as practicable for early career researchers, often women, who cannot be away from their families for long periods (Okeke *et al.*, 2017).

Improving the institutional environment: policies, culture and leadership

Literature reveals that there has been a reported lack of support by organisational management in investigating, and properly handling malpractices and misconduct within the institution and research capacity strengthening initiatives (Mathad *et al.*, 2019; Morley, 2005). This perpetuates both subtle and overt discrimination and unconscious biases, more particularly towards women researchers (Mathad *et al.*, 2019). This points to the need for consortia level SOPs as suggested by our study participants. Moreover, inclusive leadership was also perceived as a lever of institutional change towards enhancing gender equitable scientific career progression. In particular, women leaders are essential catalysts for change, as they have the potential to create conditions for the empowerment of female researchers by raising awareness of and tackling the barriers that they face, and acting as role models (Jean *et al.*, 2015; Liani *et al.*, forthcoming). As suggested in the current study, improvement on gender balance in scientific leadership positions could begin by women serving as heads of department. Other studies have found that academic head of department is the primary leadership position that impacts on women's career advancement, since they set the tone and influence the culture of the department, as well as playing a crucial role in

governance (Obers, 2015). Nonetheless, given that most male participants recognised the costs that gender inequity exerts on women researchers, there is also a need for women leaders to encourage men to be allies for women at workplace as well as support their spouses by sharing parenting duties. Indeed, other studies have suggested the need for allyship as an agenda for change, which is perceived to play a significant role in championing pro-women policy recommendations, and pushing for a favourable environment and infrastructure for all (Coe *et al.*, 2019; Dhatt *et al.*, 2017).

Our findings demonstrated the need to build and nurture a supportive research community through launching fora within institutions that encourage open dialogues for researchers to discuss and provide mutual support around career progression challenges. Related to this is the need to create safe spaces for women to connect with each other as recommended by other researchers (Dhatt *et al.*, 2017). Such safe spaces may enable women to share experiences that are unique to them, allowing validation of their experiences and a place for both personal and professional development through peer-to-peer support (Dhatt *et al.*, 2017).

Mentorship

In line with the literature (Global Research Council, 2016; Obers, 2015), many participants in our study identified the need for mentorship opportunities to enable women progress in their research careers, rise in leadership and decision making positions, and serve as role models to potentially growing number of junior and early career female scientists. This is supported by our findings which suggest the need for a structured mentoring model to systematically support mentees' personal and career needs. Indeed, lessons on this could be drawn from the mentorship programme for African Women in Agricultural Research and Development in SSA. In their assessment of this initiative, Mukhebi and colleagues identify three main roles of mentoring including providing psycho-social support, career support, and serving as role models (Mukhebi *et al.*, 2017). The authors further highlighted that for successful mentoring program, an important part of determining the right mentor-mentee match for research scientists is considering the sex of the mentor, socio-cultural background, age and personality. In addition, they also recommended twelve monthly meetings over a year of the mentoring relationships as a way of enhancing optimal levels of engagement for mentees and mentors (Mukhebi *et al.*, 2017).

Implications and future research directions

The findings from this study indicates that there is no one size fits all approach towards enhancing gender equitable scientific career progression of researchers in SSA. Achieving the participants' desired actions for positive change requires multifaceted efforts, such as resources, inclusive leadership and deliberate actions by institutional and consortia directors, and funders of working across the micro, meso and macro levels of institutions. Overall, our findings demonstrates that it is time for institutions to act through setting an agenda for positive change towards adopting more gender responsive policies

and nurturing an enabling environment that is equally conducive for career progression of everyone (Dhatt *et al.*, 2017). Notably, participants' proposed solutions for dedicated and strategic programmes or schemes with the specific purpose of enhancing gender equity for researchers, echoes the principles and actions stipulated by the Global Research Council for promoting gender equity and diversity in research (Global Research Council, 2016). Such actions should be implemented in conjunction with broader policies promoting gender equity and fostering environment that supports all researchers, and be carefully evaluated periodically to assess their long-term impact (Global Research Council, 2016). Therefore, future longitudinal research study is warranted to assess the impact of various suggested measures in contributing to the desired actions for change for DELTAS Africa Phase II (2021–2025) and other related research capacity strengthening initiatives.

Based on our findings we argue that DELTAS Africa Phase II (2021–2025) should aim to be gender aware and transformative through implementing the above proposed solutions to challenge the current systems, practices and cultures in workplace that are 'gender blind', that is insensitive to needs of women and men researchers. In doing so, it could serve as a health research capacity strengthening initiative of excellence on gender equity and diversity matters, thus offering a window of opportunity for others to learn from and scale out in Africa.

Whilst there is some evidence on some existing strategies to enhance gender equitable scientific career progression, this needs institutionalisation for achievement of better and sustainable equitable career outcomes. Indeed, we have not come across empirical evidence from Africa on how this could be done. However, the Athena Scientific Women's Academic Network programme could serve as an example of how this could be realised. Established in 2000, this programme has become a common initiative to advance gender equity in the United Kingdom higher education and research institutions. It has been explicitly linked to public research funding (Ovseiko *et al.*, 2017). Specifically, this initiative encourages and recognises commitment to advance women's careers in higher education and research in four key areas which includes: representation, progression of students into academia, journey through career milestones and working environment for all staff (Ovseiko *et al.*, 2017; Rosser *et al.*, 2019). It offers recognition awards at bronze, silver or gold levels to participating institutions, with each representing different achievements in promoting and documenting gender equity in the UK higher education institutions. This requires an assessment of gender equality, a four year action plan, and an organisational structure to implement the proposed actions (Ovseiko *et al.*, 2017). This initiative has been adopted by other countries, including Ireland and Australia (Caffrey *et al.*, 2016; Ovseiko *et al.*, 2017).

Study limitations

From a gender integration and analysis standpoint, we recognise the need to identify institutional strategies and participants' desired actions for change against the gender integration continuum. This is a tool that classifies approaches/actions

by how they address gender inequities in programming, which could help organisations or programme implementors to establish where they are positioned along the continuum to facilitate self-reflection about next steps to be taken aimed towards achieving better equitable outcomes (USAID, 2007). We acknowledge that this was beyond the scope of this study for which we recommend it for related future studies. There is also a need to enlarge the scope of this research to document more existing institutional level strategies for enhancing gender equitable scientific career progression from other DELTAS consortia and related research capacity strengthening initiatives. In doing so, it is imperative to ascertain whether there are any differences from consortia led by women compared to those of men. For instance, the Consortium for Advanced Research Training in Africa, a women-led DELTAS consortium, has gender responsive multidisciplinary doctoral training program that caters for women's practical needs around childbearing and caring (Khisa *et al.*, 2019). This is achieved through financially supporting husbands to travel with their spouse to serve as child minders in support of their wives during their engagement in short and long-term travel (Khisa *et al.*, 2019).

Conclusions

This study provides empirical evidence on strategies utilised by individual researchers and existing enabling mechanisms at institutional level towards enhancing gender equitable scientific career progression. It also offers an array of empirical evidence of participants' recommendations on the desired actions for positive change, highlighting the existing gaps that need to be filled in future programming for long-lasting impact for individual researchers and the research institutions in SSA. Specifically, it presents the strategies and actions that can be implemented at societal, institutional, programme-wide level and by research funding agencies to create more gender equitable and inclusive organizational culture that is supportive to career advancement of women and men researchers. Overall, these study findings could be useful for supporting future programming, including DELTAS Africa II initiative (2021–2025), and related research capacity strengthening programmes by providing valuable insights to research leaders, principal investigators, and funders to reflect on what strategies and actions they could tap on and implement in narrowing barriers to gender equitable scientific career progression.

Data availability

Individual privacy could be comprised if data is made publicly available. For this reason, data cannot be shared. This is because of legitimate concerns about confidentiality expressed by most participants (see their responses from the participants member-checking exercise in the methods section, under data management and analysis sub-section), who were DELTAS Africa funded research fellows, as a condition for their participation in the in-depth interviews that took narrative approach to interviewing. Therefore, we have not made the data available as the dataset, which is in the form of verbatim transcripts, cannot be de-identified without compromising anonymity. The ethical approval conditions for the project

stated that only the research team would have access to the data. However, any properly qualified qualitative researcher/s who wishes to access some of the data for legitimate reasons should contact the corresponding author of this paper individually to discuss access and conditions at Millicent.Liani@lstmed.ac.uk.

Author contributions

Author Roles:

Liani LM: Conceptualisation, Project administration, Methodology, Investigation, Formal Analysis, Writing – original draft preparation, Writing - review and editing.

Nyamongo KI: Conceptualisation, Methodology, Validation, Writing – review and editing, Supervision.

Pulford J: Methodology, Writing - review and editing, Funding acquisition.

Tolhurst R: Conceptualisation, Methodology, Validation, Writing – review and editing, Supervision, Funding acquisition.

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