PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Why women die after reaching the hospital: a qualitative critical incident analysis of the “third delay” in post-conflict northern Uganda.
AUTHORS	Alobo, Gasthony; Ochola, Emmanuel; Bayo, Pontius; Muhereza, Alex; Nahurira, Violah; Byamugisha, Josaphat

VERSION 1 – REVIEW

REVIEWER	Kate Kerber University of Alberta, Canada
REVIEW RETURNED	26-Aug-2020

GENERAL COMMENTS	Thank you for the opportunity to review this highly interesting and insightful paper on the experience of maternal death and near miss in health facilities in northern Uganda. The authors have undertaken important and difficult research that should be shared with a wide audience so that others can learn from this challenging form of inquiry, and in order to inform positive change to the healthcare provided to Ugandan women and their babies. However, there are a number of gaps in the current manuscript that should be addressed before publication. Abstract Design - there is no mention of patients being included in KIs but they are listed in Participants Review results and conclusion statements as they seem to stretch beyond what the study intended to reveal. Article summary The limitations could be more thoughtful. The lack of data resulting in over-reliance on the narratives of attendants is important to consider, but the lack of data and case information is a modifiable factor in its own right. Background The epidemiology presented in the first two paragraphs could be updated with the most current 2019 global and regional estimates. It would be helpful to have numbers for Uganda, rather than just the MMR which have wide uncertainty ranges. Though the claim makes sense, references 9,10 do not indicate that MMR is higher in the northern region. The distinction of the region as post-conflict might also need to be discussed, given that active conflict has been over for more than a decade. If Lacor is the referral hospital for the whole northern region, is there also an impact from refugees (Ethiopia, South Sudan) living in host communities? Food insecurity? Other factors? There may be additional reasons now for sub-standard care that are more explanatory than past unrest in the region. Line 48

	states that there has been no in-depth analysis of the third delay. The systematic review and the Ghana paper cited (12, 13) both highlight different analyses in other countries. Diane Morof and colleagues investigated third delays in SMGL districts in Uganda (2019, GHSP Journal). Study design: Only CIT is described. It would be helpful to know how the authors chose these two approaches (CIT and KII) and how they are complementary. Study setting: It would be helpful to know more about the setting, e.g. population, TFR, access to transportation networks, distance between Lacor and the HC IIIs. Were mothers themselves interviewed in the case of MNM? Were facility-based KIs (i.e. midwives, doctors, drivers) requested to speak about their experience in general, or a specific case of MD or MNM? Data collection: Only cases with complete records are said to have been examined but the limitations state that some of the cases were missing referral forms and other information. This is contradictory. More information could be useful here. What questions were asked for the CIT and KII? What language were the interviews conducted in? Were the interviewers known to the respondents? How was data verification performed? Was member checking done? Was verbal or written consent obtained from all participants? Results: The themes are well organized and the quotations are illustrative and well selected. Well done. The study did not look at "appropriate" EmONC it looked at situations with sub-optimal outcomes. The pathway was complex for women in this study but it might not be for all pregnant women. There is a leap to insinuate the motivations behind a pregnant women's actions. These should be described as perceptions of the participants unless in fact it is the woman in a MNM case. For example, since the capacity of facilities were not assessed in this study, the issue of bypassing might be one of perception vs reality. Likely reality, but the researchers cannot say this for certain. For example, it could be that the mother was just closer to the regional hospital than to the HCIII at the time of delivery. Since the woman herself was not interviewed in most cases "It was suggested that some women bypassed facilities they deemed to be non-functional" would be a more accurate interpretation of the data. There is a lot of context in the results which is helpful for readers, but at times it seems to go beyond the actual scope of the study (e.g. how NMS works, inadequate staffing complements at PHCCs, availability of private practitioners). These statements should be referenced if they originate from another source. The referral delays are important. The explanation of zigzagging and its antecedents could be much more clear by giving the topic its own paragraph apart from issues of the cost of ambulance rides and

	transport. Discussion: The themes lend themselves to some specific, actionable recommendations. In the spirit of maternal death inquiry, it might be helpful to clearly articulate opportunities to reduce the third delay, i.e. work with antenatal clinics to have patients identify suitable blood donors and include this on the antenatal chart (if the facility blood shortage at the hospitals is chronic), or engage with Uganda Midwifery Association to address gaps in midwifery training like access to teaching hospitals and internship opportunities. Limitations Since a big part of the Discussion focuses on the referral system, the addition of two tertiary facilities in Lira without additional step-down centres/HCIIIs might be a limitation to saturation of data and might not fully present the PHCC experience. Critical case sampling could be biased by the researchers' own interests. A discussion of positionality and reflexivity in the methods would be helpful. Conclusion: It is a stretch to say that the delays led to an increased likelihood of dying. Neither does this study present evidence that shows women who sought care from well equipped facilities were more likely to survive. Addressing all 3 delays is critical to improving maternal and newborn outcomes, however this study really only examined the third delay so it is not correct to state in the conclusion that in-facility third delay interventions are the only ones that are needed in this setting.

REVIEWER	Khalifa Elmusharf Public Health Programme, School of Medicine, University of Limerick. Ireland
REVIEW RETURNED	24-Nov-2020

GENERAL COMMENTS	The authors presented an interesting qualitative approach to explore why women die after reaching the hospital. Authors identified 5 reasons: 1) Shortage of medicines and supplies, 2) Lack of blood and functionality of the operating theatres, 3) Gaps in staff coverage, 4) Skills of the staff, and 5) Delays in inter-facility referral system. The study represents a great high-quality data. The manuscript is well written, however, there were however some minor revisions: The paper is well written and in a balanced way. The context and setting were explained briefly, but in a satisfactory way to enable the reader to contextualize the findings. The methodological approach was described in an understandable way to readers with a minimum understanding of critical incident analysis approaches. The results were presented in an abstract form and answered the research questions. The findings were discussed, and the argument was built on the findings. The conclusion is clear and satisfactory. However, there are some major points that need to be addressed:

	Background: 1. Reference 2 is a wrong reference 2. Reference 3 is an old reference Study setting and population 3. Authors used the words "survey" and "cases studies" inappropriately 4. It is not clear how many maternal deaths were included in the study. 5. It is not clear what is the sample size in each region? Sampling 1. Sampling was not described sufficiently to allow the study to be repeated. 2. How authors (or the maternal and perinatal death surveillance and response) identified the critical incidents cases (MD and MNM)? 3. For each case, how authors identified the key informants? Data collection 1. Authors must provide justifications for using verbal consents. 2. It is not clear what happened during the interview. What type of interviews were used? (structured, semi-structured, group interview, or other types). 3. Did authors use interview guide? Data analysis 4. More information is needed to explain the thematic analysis: steps used, software, etc. 5. How did the authors merge data from two sources (CIT and KI) in the analysis? Discussion: 6. Disrespectful care was not mentioned in the results. 7. The pattern of delays reported by authors are these exact 4 patterns that has been reported by Elmusharaf et al 2017 https://doi.org/10.1186/s12884-017-1463-9 8. Namely 1) Late referrals to appropriate facilities, (2) Zigzagging referral, (3) Multiple referrals, and (4) Bypassing non-functioning healthcare facilities. Authors need to illustrate that clearly to avoid plagiarism. The reviewer provided a marked copy with additional comments. Please contact the publisher for full details.

VERSION 1 – AUTHOR RESPONSE

Reviewer 1: Kate Kerber		
Abstract: Design - there is no mention of patients being included in KIs but they are listed in Participants Review results and conclusion statements as they seem to stretch beyond what the study	**Thank you, this was an oversight. we have included patients as participants for the case of maternal near miss, and corrected this through the**	Page 3 Line 17

intended to reveal	**manuscript.** **We thank the reviewer. The conclusion statements have been toned to reflect what was done**. The key statement in the results now reads as “Five reasons were identified for the delays: shortage of medicines and supplies, lack of blood and functionality of the operating theatres, gaps in staff coverage, skills of the staff, and delays in inter-facility referral system.” We have removed the statement that “non-functional facilities increases the likelihood of dying.”	 Page 3 Lines 21-35
Article summary: The limitations could be more thoughtful. The lack of data resulting in over-reliance on the narratives of attendants is important to consider, but the lack of data and case information is a modifiable factor in its own right	**Thank you. We agree with the reviewer that lack of data and case information is a modifiable factor in its own right. We have revised the limitations in the article summary and the Discussion section.**	Page 4 Lines 19-29
Background The epidemiology presented in the first two paragraphs could be updated with the most current 2019 global and regional estimates.	 **We thank the reviewer for the advice. We have updated the epidemiology with the latest trend of maternal mortality by WHO 2019.**	Page 5 Lines 6-9
It would be helpful to have numbers for Uganda, rather than just the MMR which have wide	**Although, we agree with the reviewer that it would be helpful**	Page 5

uncertainty ranges.	**to have numbers other than MMR, the official statistics from the ministry of health has only MMR.**	Line 12
Though the claim makes sense, references 9,10 do not indicate that MMR is higher in the northern region	**Thank you. We have corrected this.**	Page 5 Lines 17-18
The distinction of the region as post-conflict might also need to be discussed, given that active conflict has been over for more than a decade. If Lacor is the referral hospital for the whole northern region, is there also an impact from refugees (Ethiopia, South Sudan) living in host communities? Food insecurity? Other factors? There may be additional reasons now for sub-standard care that are more explanatory than past unrest in the region	**Whereas northern Uganda receives refugees from South Sudan (not so much Ethiopia), the study area (mid north) cares for comparatively fewer refugees compared to North west region, from which some of the reported referrals come. However, we agree with the reviewer that this can constrain the health system in this setting where Lacor hospital serves as a referral hospital. We have included a statement on this.**	Page 5 Lines 15-17
Line 48 states that there has been no in-depth analysis of the third delay. The systematic review and the Ghana paper cited (12, 13) both highlight different analyses in other countries. Diane Morof and colleagues investigated third delays in SMGL districts in Uganda (2019, GHSP Journal	**Thank you. This statement has been revised to acknowledge the papers cited in our study.**	Page 5 Lines 35-37
Study Design Only CIT is described. It would be helpful to know how the authors chose these two approaches (CIT and KII) and how they are complementary	**We have added a brief description of the KII as well. A description of how the approaches were chosen and how they are complementary has also been added.**	Page 6 Lines 12, 24
Study setting It would be helpful to know more about the	**Thank you. We have added statistics on these indicators.**	Page 6 Lines 34-

setting, e.g. population, TFR, access to transportation networks, distance between Lacor and the HC IIIs		38, 44-46
Were mothers themselves interviewed in the case of MNM??	**Yes**	Page 6 Lines 47
Were facility-based KIs (i.e. midwives, doctors, drivers) requested to speak about their experience in general, or a specific case of MD or MNM	**There were two categories of facility-based KIs – those who participated in the care of MD or MNM gave their experience specific to the cases. The second group comprised of the unit in-charges who shared their experience in general.**	Page 7
Data collection Only cases with complete records are said to have been examined but the limitations state that some of the cases were missing referral forms and other information. This is contradictory.	**Thank you. We agree with the reviewer; this was an oversight. It has been corrected.**	Page 4
More information could be useful here. What questions were asked for the CIT and KII? What language were the interviews conducted in? Were the interviewers known to the respondents? How was data verification performed? Was member checking done? Was verbal or written consent obtained from all participants?	**Thank you. All these questions have been addressed under the section on data collection.**	Page 8 Lines 26-34
Results The themes are well organized and the quotations are illustrative and well selected. Well done.	**We thank the reviewer for these positive comments**	
The study did not look at “appropriate” EmONC it looked at situations with sub-optimal outcomes.	**We agree with the reviewer; we**	Page 9

The pathway was complex for women in this study but it might not be for all pregnant women.	**have corrected this.**	Line 40
There is a leap to insinuate the motivations behind a pregnant women's actions. These should be described as perceptions of the participants unless in fact it is the woman in a MNM case. For example, since the capacity of facilities were not assessed in this study, the issue of bypassing might be one of perception vs reality. Likely reality, but the researchers cannot say this for certain. For example, it could be that the mother was just closer to the regional hospital than to the HCIII at the time of delivery. Since the woman herself was not interviewed in most cases "It was suggested that some women bypassed facilities they deemed to be non-functional" would be a more accurate interpretation of the data.	**Thank you. We have re-phrased the statements to refer to perceptions of the participants.**	Page 9
There is a lot of context in the results which is helpful for readers, but at times it seems to go beyond the actual scope of the study (e.g. how NMS works, inadequate staffing complements at PHCCs, availability of private practitioners). These statements should be referenced if they originate from another source.	**We agree with the reviewer, we have revised and removed contexts that seem beyond the scope of the study**	Pages 9-13
The referral delays are important. The explanation of zigzagging and its antecedents could be much more clear by giving the topic its own paragraph apart from issues of the cost of ambulance rides and transport	**We agree with the reviewer. We have given zigzagging referral and its explanation a separate paragraph.**	Page 14 Line 22
Discussion The themes lend themselves to some specific, actionable recommendations. In the spirit of maternal death inquiry, it might be helpful to	**We thank the reviewer for the positive comments. We agree that there is need to articulate opportunities to reduce third; we have added these**	Page 16

clearly articulate opportunities to reduce the third delay, i.e. work with antenatal clinics to have patients identify suitable blood donors and include this on the antenatal chart (if the facility blood shortage at the hospitals is chronic), or engage with Uganda Midwifery Association to address gaps in midwifery training like access to teaching hospitals and internship opportunities.	**suggestions to our recommendations**	
Limitations Since a big part of the Discussion focuses on the referral system, the addition of two tertiary facilities in Lira without additional step-down centres/HCIIIs might be a limitation to saturation of data and might not fully present the PHCC experience. Critical case sampling could be biased by the researchers' own interests. A discussion of positionality and reflexivity in the methods would be helpful	**Thank you. We have revised this section to include these very good suggestions.**	Page 15
Conclusions It is a stretch to say that the delays led to an increased likelihood of dying. Neither does this study present evidence that shows women who sought care from well-equipped facilities were more likely to survive Addressing all 3 delays is critical to improving maternal and newborn outcomes, however this study really only examined the third delay so it is not correct to state in the conclusion that in-facility third delay interventions are the only ones that are needed in this setting	**We agree with the reviewer; this section has been corrected accordingly.**	Page 16
REVIEWER 2: Khalifa Elmusharf		
Background: 1. Reference 2 is a wrong reference	**Thank you. We have revised the first two paragraphs of the Background section. These two**	Page 5

2. Reference 3 is an old reference	**references have been replaced.**	
Study setting and population: 3. Authors used the words "survey" and "cases studies" inappropriately 4. It is not clear how many maternal deaths were included in the study. 5. It is not clear what is the sample size in each region?	**Thank you. We have corrected this section. The words "survey" and "case studies" have been revised.** **Eight maternal deaths were included in the study.** **We have summarised the number of KIs from each region in table 1**	Pages 6,7
Sampling 1. Sampling was not described sufficiently to allow the study to be repeated. 2. How authors (or the maternal and perinatal death surveillance and response) identified the critical incidents cases (MD and MNM)? 3. For each case, how authors identified the key informants?	**We agree with the reviewer. We have corrected this – described into details sampling and identification of the critical incidents.** **We have also described into details how the KIs were identified – purposive sampling then snowball technique.**	Page 7
Data collection 1. Authors must provide justifications for using verbal consents.	**We have given justification in response to editorial requirement as well as the section under Data collection – the study presented no more than minimal risk or harm to the participants**	Page 8
2. It is not clear what happened during the interview. What type of interviews were used? (structured, semi-structured, group interview, or other types).	**We agree with the reviewer. This has been corrected.**	Page 8
3. Did the Authors use and interview guide?	**Yes, we used an interview guide.**	Page 8

Data analysis 4. More information is needed to explain the thematic analysis: steps used, software, etc. 5. How did the authors merge data from two sources (CIT and KI) in the analysis?	**Thank you. We have revised this section – explained thematic analysis and merging of data from CIT and KI**	Page 9
Discussion: 6. Disrespectful care was not mentioned in the results. 7. The pattern of delays reported by authors are these exact 4 patterns that has been reported by Elmusharaf et al 2017 https://doi.org/10.1186/s12884-017-1463-9 8. Namely 1) Late referrals to appropriate facilities, (2) Zigzagging referral, (3) Multiple referrals, and (4) Bypassing non-functioning healthcare facilities. Authors need to illustrate that clearly to avoid plagiarism	**Thank you. We agree with the reviewer – we have removed disrespectful care from the discussion section.** **After cross-checking, we noted the similar patterns that has been reported by *Elmusharaf et al 2017*. We have acknowledged their work and cited it accordingly. We thank the reviewer for this.**	Page 15