

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Analysis of Caesarean Section and neonatal outcome using the Robson classification in a rural district hospital in Tanzania
AUTHORS	Tognon, Francesca; Borghero, Angela; Putoto, G; Maziku, Donald; Torelli, Giovanni; Azzimonti, Gaetano; Betran, Ana Pilar

VERSION 1 – REVIEW

REVIEWER	Zilma Reis Faculty of Medicine, Universidade Federal de Minas Gerais
REVIEW RETURNED	10-Aug-2019

GENERAL COMMENTS	<p>General comments^[1]=====^[1]_{SEP}</p> <p>The study assessed the pattern of CS rates according to the Robson Classification and described maternal and perinatal outcomes by groups in a District Hospital, Tanzania. The 10-group classification is an important strategy to evaluate all labour events and outcomes, comparing CS rates within and between healthcare facilities.</p> <p>My concern with this study is the lack of contribution to the state of the art in this subject. The reflexive description of maternal and perinatal outcomes by groups is a relevant task to manage routines in perinatal care, already incorporated in maternities to overcome unnecessary CS.</p> <p>Tables and figures should be self-explanatory. Abbreviated terms within them have to be defined in a footnote</p> <p>Introduction</p> <p>Pag 4, lines 50-60. In fact, countries with fragile health systems can be more affected by the unnecessary overuse of CS than the others, high CS rates with no improvement in obstetric outcomes. Such a situation is called perinatal paradox [1, 2]. However, the authors did not mention previous reports with this interpretation. I believe that this point could raise the local meaning of the study to worldwide importance as a scientific contribution.</p> <p>[1] Rosenblatt RA. The perinatal paradox: doing more and accomplishing less. Health Aff (Millwood) 1989 Fall;8(3):158–168 [2] The perinatal paradox. Am J Public Health. 1995;85(7):906–907. doi:10.2105/ajph.85.7.906].</p> <p>Methods</p>
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Pag 5, line 46. Sample: why did you analyze some periods of two years and not 24 consecutive months? It was a random choice or convenience?

Pag 6

Lines 1-31. Setting. The description may be directed to relevant points for the interpretation of the results. There is unnecessary information as the "LGAs agreement". I could not understand the meaning of Italian NGO, as well as the context of the national health system in this maternity: is it private or public maternity? is this facility a tertiary center for high risks pregnancy in this community? this point matters for 10-groups interpretation. To clarify other influential factors than CS in maternal and perinatal outcomes, failed to say if there are Anesthesiologist and Pediatrician available in the hospital, in case of emergencies? What is the rate of congenital malformations?

Line 40. Variables. Mode of delivery. SVD (simple vaginal delivery) is not clear for me. I suggest you adjust the definition for a unequivocal meaning or give more details. Is SVD the vaginal delivery, any presentation managed by midwives without interventions (episiotomy, epidural, oxytocin-stimulation)? Since the neonatal outcome was worse in this mode of delivery than CS, please clarify.

Regarding the obstetric protocol of assistance, partograph and mode of fetal heart rate monitoring were not mentioned. I believe such details could be important during the interpretation of the results of CS indications.

Pag 7 Line 5. Please change gr for g, the abbreviation of grams

Results:

Examining Table 2 according to 10-Groups reference [3], Group 5 was above 10% of women (15,4%). Group 8 was above 1,5-2% and Group 10 was above 5%, pointing this maternity might be a referral centre for pregnancies complicated with maternal or fetal diseases.

Subgroup 2b with 100% of CS rate, as well as the subgroup 4b pointed no effective VBAC practice in this unit. This relevant point was properly discussed.

Table 3. The study used birth weight ≥ 2500 g as a proxy for gestational age ≥ 37 weeks. I suggest mentioning this adaptation in Table 3, changing 37 for $>2,5$ kg or with a table footnote.

Pag 11. Line 29. "Major contribution to severe neonatal outcome was given by Group 1 (27.7%), Group 10 (24.5%) and Group 3 (19,1%)". Probably, there was excessive medical intervention (CS) in Group 1 and 3, accompanied by no association with desirable neonatal outcome. This was the called "Perinatal paradox". I suggest commenting on this point during the discussion.

Page 11. Line 33. There is no breech presentation in Group 10. This phrase deserves adjustment.

Discussion

Pag 12. Line 45. I could not understand. "This hypothesis could be confirmed by the higher CS rate in women referred from other

	<p>facilities (63,7% in our study)". You told us 35.2% of CS in your study (Pag 8, line 3).</p> <p>Pag 13. Line 53. "Despite being the lower risk groups, of the total 152 perinatal deaths during the study period, 37 (24%) and 29 (19%) occurred in Groups 1 and 3, respectively." What was the frequency of congenital anomalies in this group? Statistics of settings without legal abortion has perinatal mortality rates impacted by severe malformations.</p> <p>Pag 17. Line 26. Ethics approval. Please provide more details, as the registration number, or equivalent, of the process approval.</p>
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REVIEWER	Kaled Mikki Zimmo, PHD degree of Obstetrics and Gynecology Intervention Center, Oslo University, Norway
REVIEW RETURNED	25-Aug-2019

GENERAL COMMENTS	<p>Dr. Kaled Mikki Zimmo PHD degree of obstetrics and gynecology, Intervention center, Oslo university hospital Conflicts of interests: None</p> <p>This is an interesting manuscript that assess the pattern of CS rates according to the Robson 10 groups classification for Caesarean section and describe maternal and perinatal outcomes by group in a District Hospital in Tanzania. This classification was becoming popular in the last 5 years as many publications were used this classification system worldwide. The introduction well organized, arranged and added more details and focused on the objective of study. I wonder whether the authors can include more women to increase the sample size to be more effective and conclusive and I don't agree about the arguments why the authors included the two time periods and did not include the periods in-between. Additionally, the CS rate 35% how the authors calculated study design statistical analysis and study periods were not arranged well and vague. The discussion needs to be reformulated and rearranged according to the study results with adding more details.</p> <p>Major points:</p> <ol style="list-style-type: none"> 1. The sample size and data collection and participants need more explanations and details. 2. The study tool as data collection form must be attached as supplementary file. 3. P6, L 12, The authors stated that the annual deliveries at the study hospital were 2300 per year, while only they included 3012 in the two-time period of the study, please more explanations? 4. P7, L3, the sentence (Because of the elevated number of missing or wrong date for last menstrual period (LMP))..... Please, classify how many cases you use LMP vs gestational age what are the local protocol that the study hospital follow when unsure date by LMP?. 5. P8, L 3-5, the sentence (The institutional CS rate was 35.2% of all births.) here, the authors calculate the CS rate in the included study population sample. please, we to need to know the total number of CS rate in the all deliveries in the hospital even not included in the study. 6. P10, L 28-31 AND table 4. Are these indications for CS classified according to admission sheet in the hospital or according to the study data collection sheet or according to international guidelines indication list , please clarify?
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	<p>7. P13. L 30-35, please shift this paragraph with the table 6 to the methodology part .</p> <p>Minor points:</p> <ol style="list-style-type: none"> 1. P4, L 7 , please remove obstetric pathologies and replace with urgent obstetrics conditions or complications. 2. P4, L17-18, please replace however by CS and remove this procedure in the same sentence. 3. P5, L3-4, I prefer to add reference. 4. P5, L31-33 please remove the whole sentence from provide lessons....., this is not the first study in low- income countries. 5. P5, l 51-52, the sentence avoids seasonal bias, unclear please add more explanations or remove. 6. P6, L6-7, CUAMM and NGO please add the full names. 7. P7, L2-5, how many missing's and which other variables including missing's please enumerate and classify. 8. The four types of episiotomy (check Kalis et al 2012 and ACOG 2016).
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REVIEWER	Abera Kenay Tura Haramaya University, Ethiopia
REVIEW RETURNED	28-Aug-2019

GENERAL COMMENTS	<p>-The authors addressed an important topic in a rural referral hospital. The authors better clarify the following points to clearly present their study.</p> <p>-The authors paid less attention to the description of the 10 Robson classification (and it extension)</p> <p>-It is not clear who collected the data; when, how long and source of information.</p> <p>-It is essential to acknowledge that the CS rate of 35.2% could be over estimation as referral cases are included in the numerator while births occurring in the lower facilities are not considered in the denominator. So, thorough evaluation of indication within each group and its appropriateness may be more important.</p> <p>-It is also not clear who made the decision to pick one indication in case of multiple indications.</p> <p>-In addition to indicating who performed the CS, who made the decision may be important.</p> <p>-The authors should explain what they did to avoid under reporting (in the case of paper based documentation)</p>
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VERSION 1 – AUTHOR RESPONSE

Reviewer(s)' Comments to Author:

Reviewer: 1

- *The study assessed the pattern of CS rates according to the Robson Classification and described maternal and perinatal outcomes by groups in a District Hospital, Tanzania. The 10-group classification is an important strategy to evaluate all labour events and outcomes, comparing CS rates within and between healthcare facilities. My concern with this study is the lack of contribution to the state of the art in this subject. The reflexive description of maternal and perinatal outcomes by groups is a relevant task to manage routines in perinatal care, already incorporated in maternities to overcome unnecessary CS.*

RESPONSE: We agree that the Robson classification is a well-known whose use is growing worldwide. However, there is an important gap in the use between high-income and low-income countries as with

many other health interventions and we believe there is the need to document and support these efforts in low-resource countries. In addition, the Robson classification is not so well-known in Tanzania, in particular to evaluate neonatal outcomes. Furthermore, this data is not always available, as the hospital does not have an electronic database per patient and the data required for Robson's classification are not routinely collected which makes this a very valuable example of how the classification can be implemented with minimal resources. We think that even if this is not a novel tool, the focusing on perinatal health and the caesarean section decision-making process can help local authorities better organize services and use this tool more effectively. We believe, experience of this type need to be documented because it can be of use to other countries in similar conditions.

- *Tables and figures should be self-explanatory. Abbreviated terms within them have to be defined in a footnote*

RESPONSE: Thank you. We modified both tables and figures to make them self-explanatory.

Introduction

- *Pag 4, lines 50-60. In fact, countries with fragile health systems can be more affected by the unnecessary overuse of CS than the others, high CS rates with no improvement in obstetric outcomes. Such a situation is called perinatal paradox [1, 2]. However, the authors did not mention previous reports with this interpretation. I believe that this point could raise the local meaning of the study to worldwide importance as a scientific contribution.*

[1] Rosenblatt RA. The perinatal paradox: doing more and accomplishing less. Health Aff (Millwood) 1989 Fall;8(3):158–168

[2] The perinatal paradox. Am J Public Health. 1995;85(7):906–907. doi:10.2105/ajph.85.7.906].

RESPONSE: Thank you for this suggestion with which we agree. We have included and discussed the Perinatal Paradox in the context of our results in the Discussion section of the manuscript as you suggested. We have also included the two references you mentioned.

Methods

- *Pag 5, line 46. Sample: why did you analyze some periods of two years and not 24 consecutive months? It was a random choice or convenience?*

RESPONSE: A more complete explanation on the choice of the sample has been added in Design and participants in Methods session:

“During these two periods, an Italian obstetrics and gynecology resident doctor was available to support the hospital’s maternity staff and ensure the completeness of patient charts. Because the resident doctor was absent in the labour ward from July 2014 to February 2015, the information routinely collected in that period was considered inadequate for analysis and thus could not be included. Foetal position and information on previous deliveries are two important variables for the Robson classification which were not collected and recorded systematically and routinely.

In addition, combining the two periods made it possible to increase our study population and avoid seasonal bias due to the dry and rainy season.”

- *Pag 6
Lines 1-31. Setting. The description may be directed to relevant points for the interpretation of the results. There is unnecessary information as the “LGAs agreement”. I could not understand the meaning of Italian NGO, as well as the context of the national health system in this maternity: is it private or public maternity? is this facility a tertiary center for high risks pregnancy in this community? this point matters for 10-groups interpretation.*

RESPONSE: Thank you for this comment. The NGO is supporting the hospital with provision of health care staff (one Public Health expert, one Pediatrician/Neonatologist, one Obstetrician/Gynecologist), participation in hospital governance structural enhancements in maternal ward and neonatal unit and training of local staff.

For the Tanzanian Health System Tosamaganga hospital is a District hospital, considered as Secondary level hospital (tertiary level are the Regional one). We specified the role of the hospital saying that is the only CEmOC Center in the district, serving 265.000 inhabitants. We have now added all this information In Setting under the Methods section

We have now also added more information on the relationship between the hospital and the public health system: **“Although the hospital is a private facility, it has been officially integrated into the Tanzanian public health system since 2007 in the context of the Private Public Partnership (PPP) framework and is recognised as a Council Designated Hospital for Iringa District Council.”**

- *To clarify other influential factors than CS in maternal and perinatal outcomes, failed to say if there are Anesthesiologist and Pediatrician available in the hospital, in case of emergencies? What is the rate of congenital malformations?*

RESPONSE: Thank you for this comment. Only one pediatrician was working in the hospital. He was the one on call in case of complicated labour, but majority of the emergency neonatal resuscitation were performed by midwives. Anesthesia during surgical operations was performed by skilled technician (there was no Anesthesiologist in the hospital), but they were not trained in resuscitation.

We have now added this information under Setting inside Methods Section: **“There was no anesthesiologist in the hospital. Pediatric Ward (32 beds) was served by only one pediatrician present during the day in and on-call at night.”**

- *Line 40. Variables. Mode of delivery. SVD (simple vaginal delivery) is not clear for me. I suggest you adjust the definition for a unequivocal meaning or give more details. Is SVD the vaginal delivery, any presentation managed by midwives without interventions (episiotomy, epidural, oxytocin-stimulation)? Since the neonatal outcome was worse in this mode of delivery than CS, please clarify.*

RESPONSE: Thank you for this note. We have now added a more detailed explanation of the definition: **“Final mode of delivery was classified into two categories: vaginal delivery and caesarean section. Vaginal delivery could have been either (1) simple vaginal delivery which included all vaginal deliveries not requiring forceps or vacuum although they may have had episiotomy; and (2) operative vaginal delivery which included all vaginal deliveries that required forceps or vacuum.”**

- *Regarding the obstetric protocol of assistance, partograph and mode of fetal heart rate monitoring were not mentioned. I believe such details could be important during the interpretation of the results of CS indications.*

RESPONSE: Fetal heart was assessed only by intermittent auscultation with a Pinard by midwives (recommended by the 2018 Intrapartum Care Recommendations). No cardiotocography available. There was an US machine in the department, but used only by doctors in case of emergency, not for the routine fetal heart monitor. This has been clarified in Setting under the Methods.

- *Pag 7 Line 5. Please change gr for g, the abbreviation of grams*

RESPONSE: We changed the abbreviation.

Results:

- *Examining Table 2 according to 10-Groups reference [3], Group 5 was above 10% of women (15,4%). Group 8 was above 1,5-2% and Group 10 was above 5%, pointing this maternity might be a referral centre for pregnancies complicated with maternal or fetal diseases.*

RESPONSE: We also thought that the larger sizes of groups 5, 8 and 10 could be because the hospital was a referral center and therefore with a population that is particularly at higher risk, as the literature suggests. We addressed this hypothesis in Table 4: **“The size of Group 10 is 6.2% is slightly higher than that proposed by Robson (5%) and that found in the WHO Study (4.2%). Even if Tosamaganga Hospital is a referral hospital, only 168 women (5.6%) were referred, 107 (63.7%) of whom delivered by CS. For this reason, we consider that the larger sizes of Groups 8 and 10 cannot be justified by a particularly high-risk population.”**

It would have been necessary to analyze in more detail the provenience of women, effectiveness of the referral system and the indications for referral to evaluate the selection of complicated cases at hospital level. Unfortunately these variables were not collected in our work.

- *Subgroup 2b with 100% of CS rate, as well as the subgroup 4b pointed no effective VBAC practice in this unit. This relevant point was properly discussed.*
- *Table 3. The study used birth weight ≥ 2500 g as a proxy for gestational age ≥ 37 weeks. I suggest mentioning this adaptation in Table 3, changing 37 for $>2,5$ kg or with a table footnote.*

RESPONSE: Thank you for this comment. We added a footnote on this both in Table 2 and 3.

- *Pag 11. Line 29. “Major contribution to severe neonatal outcome was given by Group 1 (27.7%), Group 10 (24.5%) and Group 3 (19,1%)”. Probably, there was excessive medical intervention (CS) in Group 1 and 3, accompanied by no association with desirable neonatal outcome. This was the called “Perinatal paradox”. I suggest commenting on this point during the discussion.*

RESPONSE: Thank you for this comment. We have now described this point in the discussion section as suggested.

“Severe neonatal outcomes were recorded for 220 newborns, almost half of them in Groups 1 and 3, which may indicate that a high CS rate in these groups did not guarantee better quality of care and was not accompanied by better neonatal outcomes. This is consistent with the phenomenon of “Perinatal Paradox” which has been described in the literature[40, 41], as the inconsistency between “our superb ability to care for the individual patient and our dismal failure to address the problems of the larger society”[41]. The overuse of unnecessary technology in low-risk women translates in that the growing number of surgical procedures being performed are not associated with significant improvements in terms of maternal and neonatal outcomes.”

- *Page 11. Line 33. There is no breech presentation in Group 10. This phrase deserves adjustment.*

RESPONSE: We modified the sentence. **“Considering the incidence in each category, the groups with the highest severe neonatal outcome rate were Groups 6 (33.3%), 7 (28.1%), indicating a high risk for newborn in breech deliveries, and 10 (29%) for preterm babies”**

Discussion

- *Pag 12. Line 45. I could not understand. “This hypothesis could be confirmed by the higher CS rate in women referred from other facilities (63,7% in our study)”. You told us 35.2% of CS in your study (Pag 8, line 3).*

RESPONSE: Thank you for the note. We have now added a paragraph in the Results section to describe that among the Pregnant Women referred the CS rate was higher (among the 168 women referred, 107 delivered by CS).

- *Pag 13. Line 53. “Despite being the lower risk groups, of the total 152 perinatal deaths during the study period, 37 (24%) and 29 (19%) occurred in Groups 1 and 3, respectively.” What was*

the frequency of congenital anomalies in this group? Statistics of settings without legal abortion has perinatal mortality rates impacted by severe malformations.

RESPONSE: We completely agree that this information would be important for a better interpretation of the neonatal outcome. Unfortunately, data on malformations and congenital anomalies was not available in the hospital. We have added this gap in the Limitation section.

- *Pag 17. Line 26. Ethics approval. Please provide more details, as the registration number, or equivalent, of the process approval.*

RESPONSE: We have now provided the reference number of the hospital approval.

Reviewer: 2

- *This is an interesting manuscript that assess the pattern of CS rates according to the Robson 10 groups classification for Caesarean section and describe maternal and perinatal outcomes by group in a District Hospital in Tanzania. This classification was becoming popular in the last 5 years as many publications were used this classification system worldwide. The introduction well organized, arranged and added more details and focused on the objective of study. I wonder whether the authors can include more women to increase the sample size to be more effective and conclusive and I don't agree about the arguments why the authors included the two time periods and did not include the periods in-between. Additionally, the CS rate 35% how the authors calculated study design statistical analysis and study periods were not arranged well and vague. The discussion needs to be reformulated and rearranged according to the study results with adding more details.*

RESPONSE: Thank you for your comments. We agree that this is unconventional and strange, and we understand it raises questions. Unfortunately the hospital does not have a general patient database therefore all the information used in the present study was collected retrospectively from paper charts and registries in the labour ward. We found that these sources of information were reliable only when an additional doctor was present in the hospital. Resident doctors in Obstetric and Gynecology can spend a period of their residency (in a program called JPO – Junior Project Officer) in a Doctors with Africa CUAMM project. During this period, they follow a senior specialist as tutor and they help the hospital staff with data collection as well. This is mainly the reason for the two time periods instead of a continuous data collection. The quality of the data would have rendered the results unreliable and useless. However, we are not aware of any reason or activity that would make the periods of data collection different from the periods where data was not collected and thus we believe there are no clinical or outcome differences between the periods of data collection and the period where data was not collected. We argue that the results are valid and applicable to the hospital in general basis despite this limitation. We have now incorporated this explanation under the methods and improved the text according to your suggestion.

Major points:

- *The sample size and data collection and participants need more explanations and details.*

RESPONSE: A more complete explanation on the choice of the sample has been added in Design and participant under the Methods section. More details on data collection has now been integrated in the text in the paragraph Variable and data collection in Methods.

- *The study tool as data collection form must be attached as supplementary file.*

RESPONSE: We have now attached the Excel file used as data collection tool as a supplementary file.

- *P6, L 12, The authors stated that the annual deliveries at the study hospital were 2300 per year, while only they included 3012 in the two-time period of the study, please more explanations?*

RESPONSE: The annual number of deliveries is provided as a general overview of the hospital workload. But the study period considered 15 months and in that period 3052 deliveries occurred. The decision to add the 2 different period was taken in order to increase the population study, to avoid seasonal differences and because no organizational changes within the maternity ward happened. Therefore the management of labour and emergencies was the same throughout the period analyzed. We have now explained this more clearly in the manuscript in Setting under the methods section (**“Tosamaganga Hospital handles approximately 2,300 deliveries a year.”**).

- *P7, L3, the sentence (Because of the elevated number of missing or wrong date for last menstrual period (LMP)..... Please, classify how many cases you use LMP vs gestational age what are the local protocol that the study hospital follow when unsure date by LMP?.*

RESPONSE: In the patient's charts Gestational Age was reported as LMP, but LMPs collected during the anamnesis were not reliable because women were not precise in reporting and many of them were missing.

In the labour registry Gestational age sometimes was calculated through fundal height measurement; but also this information was incomplete and not comparable with other women therefore was not collected for this study. More information have been now added in the manuscript under Variables and Data Collection in Methods: **“Because the date of last menstruation period (LMP) was missing form most of the records (n=2,444; 81.1%), we used birth weight \geq 2500 g as a proxy for gestational age \geq 37 weeks.”**

- *P8, L 3-5, the sentence (The institutional CS rate was 35.2% of all births.) here, the authors calculate the CS rate in the included study population sample. please, we to need to know the total number of CS rate in the all deliveries in the hospital even not included in the study.*

RESPONSE: Thank you for this note. We have now clarified this. We changed the text because 35.2% was not the Institutional CS rate for the period, but was the CS rate within the study population. The total deliveries occurred were 3052 and for 40 of them we didn't registered the mode of delivery. Although the missing is a small number (only 1,3%) we cannot assume which was the institutional rate exactly. We modified it in the Result session and in the abstract as well according to your suggestion.

- *P10, L 28-31 AND table 4. Are these indications for CS classified according to admission sheet in the hospital or according to the study data collection sheet or according to international guidelines indication list , please clarify?*

RESPONSE: The list of indication was already established in the patient's charts compiled by the surgeon ticking in the box corresponding to the indication There was the possibility to write a free text in the “Other” variable, but that information was not codified when data were collected. If more than one cesarean indication was given, only one was recorded in the study's data collection and the priority was given according to the list reported. Our priority list was constructed based on an available WHO systematic review (Torloni MR et al. [reference n. 19] and previous experience from Althabe F et al [reference n.23] and we included some context-based modifications:

- Given the high number of “previous CS” and the fact that previous CS was not an absolute indication for CS, we decided to prioritize Dystocia;
- Although Altabe et al. used the groups as “maternal causes” and “fetal causes”, we aimed to analyze the data with more precision. For this reason, we separated and created individual entities for CPD, Malpresentation and twins as indications for CS.

We have now clarified this in the text, adding also the necessary references, in Variable and data collection in Methods section.

- *P13, L 30-35, please shift this paragraph with the table 6 to the methodology part .*

RESPONSE: We have moved the analysis of Robson Classification in Results as Table 4.

Minor points:

- *P4, L 7 , please remove obstetric pathologies and replace with urgent obstetrics conditions or complications.*

RESPONSE: We changed the text as suggested.

- *P4, L17-18, please replace however by CS and remove this procedure in the same sentence.*

RESPONSE: We changed the text in this particular paragraph and we made a deep revision of the paper form.

- *P5, L3-4, I prefer to add reference.*

RESPONSE: We slightly changed the paragraph, according also to other reviewer suggestion, focusing mainly on description of inequities and we added references (Ogundele OJ, BMC Pregnancy and Childbirth. 2018)

- *P5, L31-33 please remove the whole sentence from provide lessons....., this is not the first study in low- income countries.*

RESPONSE: Modification done, we deleted that sentence.

- *P5, l 51-52, the sentence avoids seasonal bias, unclear please add more explanations or remove.*

RESPONSE: The data collection period of 2015 was including mainly dry-season months (usually from May to October); for this reason adding the 2014 period permitted to include January – March where rain is very common and the burden of malaria increases in all the region. We now gave a more complete explanation in the text (“**to avoid seasonal bias due to the dry and rainy season**”)

- *P6, L6-7, CUAMM and NGO please add the full names.*

RESPONSE: Modification done, we added the full names in Setting.

- *P7, L2-5, how many missing's and which other variables including missing's please enumerate and classify.*

RESPONSE: We now specified that “**Because the date of last menstruation period (LMP) was missing form most of the records (n=2,444; 81.1%)..**”. For this reason was not possible to use Gestational Age data in this study, therefore we used birth weight as a proxy.

- *The four types of episiotomy (check Kalis et al 2012 and ACOG 2016).*

RESPONSE: Unfortunately no data on episiotomy were collected from the charts, neither the type nor the total number of episiotomy performed.

In Variables and Data Collection section we now specified that simple vaginal delivery “**included all vaginal deliveries not requiring forceps or vacuum although they may have had episiotomy**”

Reviewer: 3

The authors addressed an important topic in a rural referral hospital. The authors better clarify the following points to clearly present their study.

- *The authors paid less attention to the description of the 10 Robson classification (and its extension)*

RESPONSE: For the sake of space and keep the length of the article to standard practice, we do not fully describe the Robson tool in the Methods since it has become a well-known classification worldwide. However, we have added the description of the Robson classification in the Supplementary file (we will be happy to move it to the main text if the Editors advise to do so). For completeness of information we moved the reference on the WHO implementation manual in the Method session.

- *It is not clear who collected the data; when, how long and source of information.*

RESPONSE: A more complete explanation on the choice of the sample has been now added in Design and participant in Methods.

Now we have also added details on the data collection: **"The data was collected retrospectively from hospital registers (Labour Room, Maternity Ward and Operating Theatre) and patients charts in a Microsoft Excel data-extraction form specifically designed for this study (see Supplementary File)".**

Data has been computerized by one of the authors, BA (specified in Contributors section).

- *It is essential to acknowledge that the CS rate of 35.2% could be over estimation as referral cases are included in the numerator while births occurring in the lower facilities are not considered in the denominator. So, thorough evaluation of indication within each group and its appropriateness may be more important.*

RESPONSE: We absolutely agree that the CS rate at hospital level cannot be meaningful if we don't consider the catchment area. Tosamaganga hospital during the study period was the only center available to perform CS for a population of 265.000 inhabitants. It's therefore possible to think that despite the high intra-hospital CS rate, the CS rate at population level was however below WHO standards. This evaluation is what led us to apply Robson classification in order to understand the characteristics of the women delivering in the hospital.

Although the CS rate among women referred was higher, the percentage of referral was very low and the majority of the women who delivered in the hospital were in low-risk Groups in the Robson classification.

As mentioned in a previous comment, it would have been necessary to analyze with more detail the provenience of women and the effectiveness of the referral system to evaluate the selection of complicated cases at hospital level; unfortunately these variables were not collected in our work.

We have now added a more clear explanation on CS rate within the referred women in Table 4 **(168 deliveries (5,6%) were referred of which 107 (63,7%) delivered by CS).**

- *It is also not clear who made the decision to pick one indication in case of multiple indications.*

RESPONSE: We have address this comment in a response to Reviewer #2.

The list of indication was already established in the patient's charts compiled by the surgeon ticking in the box corresponding to the indication There was the possibility to write a free text in the "Other" variable, but that information was not codified when data were collected. If more than one cesarean indication was given, only one was recorded in the study's data collection and the priority was given according to the list reported. Our priority list was constructed based on an available WHO systematic

review (Torloni MR et al. [reference n. 19] and previous experience from Althabe F et al [reference n.23] and we included some context-based modifications:

- Given the high number of "previous CS" and the fact that previous CS was not an absolute indication for CS, we decided to prioritize Dystocia;
- Although Altabe et al. used the groups as "maternal causes" and "fetal causes", we aimed to analyze the data with more precision. For this reason, we separated and created individual entities for CPD, Malpresentation and twins as indications for CS.

We have now clarified this in the text, adding also the necessary references, in Variable and data collection in Methods section.

- *In addition to indicating who performed the CS, who made the decision may be important.*

RESPONSE: Thank you for this note. We agree that this information would be very important, but this data was not available in the records it was not possible to reach these data from a retrospective data collection (this was retrospective data collection study).

We have now added this gap in the Limitation section.

- *The authors should explain what they did to avoid under reporting (in the case of paper based documentation)*

RESPONSE: Labour room, Maternity and Operating theatre registries were analyzed and compare with the patient's charts available. We found that 3052 deliveries occurred during the study period, and for 40 of them (1,3%) the information necessary for the Robson Classification was not available.

We have now specified that "**All data sources were compared to verify the quality of the information**" in Variable and data collection section.

VERSION 2 – REVIEW

REVIEWER	Zilma S N Reis Universidade Federal de Minas Gerais, Brazil
REVIEW RETURNED	09-Oct-2019

GENERAL COMMENTS	The manuscript achieved enough quality for publication. The responses for the raised questions were satisfactory, and modifications adequately implemented in the manuscript sections. Please, check the spelling: Table 4 - The size of Groups 3 + 4 is 33.9%. Since Tanzania [haa] a high fertility rate, we expected a higher number of multiparous women.
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REVIEWER	Kaled Mikki Zimmo intervention centre, University of Oslo
REVIEW RETURNED	06-Oct-2019

GENERAL COMMENTS	The authors responded to my comments clearly, thank you
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