ORIGINAL RESEARCH ARTICLE

Symphysis-fundal height, gestational age and its value for identification of foetuses at risk in rural Tanzania: A qualitative follow-up study

DOI: 10.29063/ajrh2021/v25i5.15

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Abstract

Preterm birth and abnormal foetal growth increase the risk of perinatal morbidity and mortality. Timely identification of foetuses at risk is critical to improving maternal and neonatal outcomes. The objective of this study was to increase understanding of the quality of foetal growth monitoring during antenatal care in Tanzania. Between 2015 and 2017, 13 women were followed throughout their pregnancy, childbirth and postpartum period. Participants were recruited using a staggered approach at selected health facilities. Data collection included direct observations of 25 of 48 antenatal care consultations, review of the women's antenatal cards, 88 in-depth interviews and participant observation at the health facilities. Six women had facility births and seven had home births. There was one stillbirth, one preterm birth and two term infants died between the age of 3-6 months. Of the 9 newborns with a known birthweight, 3 were possibly growth-restricted. During 12 ANC visits (25%) Symphysis-Fundal Height (SFH) was not recorded and during 22 visits (46%) the recorded Gestational Age (GA) was incorrect. Despite regular assessment of SFH, three possible growth-restricted infants remained undetected. There is a need to improve nurse-midwives ability to determine a reliable GA and improve critical reflection on SFH measurement. *(Afr J Reprod Health 2021; 25[5]: 140-149).*

Keywords: Growth monitoring, foetal growth restriction, antenatal care, quality of care

Résumé

Les naissances prématurées et la croissance fœtale anormale augmentent le risque de morbidité et de mortalité périnatales. L'identification en temps opportun des fœtus à risque est essentielle pour améliorer les résultats maternels et néonatals. L'objectif de cette étude était d'améliorer la compréhension de la qualité du suivi de la croissance fœtale pendant les soins prénataux en Tanzanie. Entre 2015 et 2017, 13 femmes ont été suivies tout au long de leur grossesse, de leur accouchement et de leur période post-partum. Les participants ont été recrutés selon une approche échelonnée dans des établissements de santé sélectionnés pour s'assurer que les chercheurs ne suivent pas plus de quatre femmes en même temps. La collecte de données comprenait des observations directes de 25 des 48 consultations prénatales, l'examen des fiches prénatales des femmes, 88 entretiens approfondis et l'observation participante dans les établissements de santé. Six femmes ont accouché dans les établissements de santé et sept ont accouché à domicile. Il y a eu un mort-né, une naissance prématurée et deux nourrissons nés à terme sont décédés entre l'âge de 3 à 6 mois. Sur les 9 nouveau-nés dont le poids de naissance était connu, 3 présentaient un possible retard de croissance. Au cours de 12 visites de soins prénataux (25 %), la Symphyse-Hauteur Utérine (SHU) n'a pas été enregistrée et lors de 22 visites (46 %), l'Age Gestationnel (AG) enregistré était incorrect. Malgré une évaluation régulière de la SFH, trois nourrissons présentant un possible retard de croissance n'ont pas été détectés. Il est nécessaire d'améliorer la capacité des infirmières sages-femmes à déterminer une AG fiable et d'améliorer la réflexion critique sur la mesure de la SHU. *(Afr J Reprod Health 2021; 25[5]: 140-149).*

Mots-clés: Surveillance de la croissance, retard de la croissance fœtale, soins prénataux, qualité des soins

Introduction

Worldwide child mortality rates have reduced significantly. Nevertheless, the 2.5 million annual neonatal deaths and 2.6 million annual stillbirths remain a global concern[1,2]. Particularly, the large majority of these deaths that occur in low-resource settings[3]. Preterm birth and abnormal foetal growth increase the risk of perinatal morbidity and mortality and foetal growth restriction (FGR) is also

associated with stillbirths[4]. Furthermore, preterm and growth-restricted infants are prone to infections and, if they survive the early neonatal period, have increased likelihood of stunting and wasting during the first 18 months of life. Consequently, FGR also increases the risk of undernutrition during infancy[5]. In order to prevent perinatal and infant deaths related to preterm birth, abnormal foetal growth and FGR, timely identification of foetuses at risk and birth in settings capable to provide the essential care and follow-up needed, are required. Furthermore, growth-restricted foetuses might indicate the presence of placenta insufficiency (due to pre-eclampsia, or placental malaria) or poor maternal pre-pregnancy nutrition status requiring increased attention for the well-being of the mother[3].

Assessment of foetal growth is an essential part of antenatal care. Foetal growth assessment can be done by abdominal palpation of the fundal height, Symphysis-Fundal Height (SFH) measurement or through serial ultrasound assessment. Ultrasound assessment is resource intensive and not widely available in low-resource settings[6]. SFH measurement is the distance between the pubic symphysis to the uterine fundus and can help to determine or confirm the Gestational Age (GA). For foetuses growing normally, the SFH measurements in centimetres, obtained with a tape measure, should correspond to the number of weeks of gestation, with allowance of a 2-cm difference[7]. Repeated SFH measurements allow for monitoring of foetal growth and timely identification of foetuses at risk of FGR. However, there remains insufficient evidence of the effectiveness of SFH to detect FGR[7], and in its recent antenatal care guideline, the World Health Organization does not recommend the use of SFH in areas where it is not already standard practice[6]. Both abdominal palpation and/or SFH are an important element of clinical practice and beyond growth monitoring, can help to detect multiple pregnancy, macrosomia, polyhydramnios and oligohydramnios[6].

Because of its low cost, ease of use and need for very little training, SFH measurement continues to be used in many countries in sub-Saharan Africa. In Tanzania, SFH measurement is standard practice and recommended in the local antenatal care guidelines[8]. Despite its low sensitivity, SFH is considered a valuable screening method for foetuses at risk, although it is dependent on technique, frequency, measurement, and experience of the health provider performing the measurement. Additionally, interpretation of FGR is not determined based on SFH alone, but based on the complete clinical picture, including other medical conditions of the women and obstetric history[9]. Although SFH measurement is relatively easy to implement, as shown by high coverage of both abdominal palpation and SFH measurement in several studies[10,11], foetal growth monitoring and identifying at risk pregnancies in low-resource settings is challenging and complex. Primarily because of the uncertainties associated with determination of gestational age[12]. The objective of this study was to increase understanding of the use of SFH and GA measurement during antenatal care in a rural setting in Tanzania and to assess the quality of these assessments to identify foetuses at risk.

Method

Study design

This study relies on data that was collected for a qualitative follow-up study, which aimed to gain an in-depth understanding of the choices women made about their care during pregnancy and childbirth. Findings of the main study will be published elsewhere. For this paper we conducted descriptive analysis of the care received during 48 antenatal care consultations provided to 13 women that were followed throughout their pregnancy and childbirth. We draw upon multiple data collection methods including: direct observations, review of women's antenatal cards, repeated in-depth interviews with women after each clinic visit and participant observations at the selected health facilities. The latter provided information on facility supplies and materials, allowed for informal conversations and interviews with health staff and helped to gain an understanding of the reality of providing antenatal care in a rural setting in Tanzania. Prior to this study we conducted a mixed-methods study regarding the quality of antenatal care provision in a selected number of facilities in the same district. Findings of this study are reported elsewhere[11].

Study setting and sites

The study took place from September 2015 to February 2017 in one district in the Lake Zone region of Tanzania. Two health centres and one district hospital were selected for this study based on previous experience working with the staff from these facilities. There are four health centres in the district and each of the two selected are indistinct geographical locations. One is next to the main tarmac road, with easy access to the district hospital and the other is located more rural. During the data collection period, ASM and SP spent a total of 52 days at the ANC clinic or maternity ward of the three health facilities.

Study sample and recruitment

A purposive sampling technique was used to ensure that participating women had varied backgrounds, based on parity, socio-economic status, living distance from the health facility, previous experience with both home and facility birth, and diverse medical and obstetric histories. Women were approached during their first or second antenatal care visit, if this visit was before 22 weeks of gestation. Women's permission for participation in the study was requested during the first interview at the woman's house. Participants were recruited using a staggered approach at selected health facilities to ensure researchers did not follow more than four women at the same time. 22 women were recruited into the study. Six women could not be located for follow-up interviews after their first ANC visit (two attempts were made to follow up), one woman refused to participate and one woman was lost to follow-up after moving to another district. One woman was followed throughout her pregnancy and birth, but did not allow us to see her ANC card and parts of the care she received and therefore was also excluded from the analysis.

Data collection

ASM (a medical doctor) and SP (a nurse) followed 13 women throughout their pregnancy, birth and in the post-partum period. 25 ANC visits were observed out of a total of 48 visits and observation reports were written after each day. We were unable to observe all visits for several reasons: women sometimes attended the clinic on a different date than scheduled; scheduled return dates were sometimes on holidays or weekends; sometimes women opted to attend to a different facility; or we were unable to be present at the health facility during their visit. The researchers, on occasion, participated in the care of women due to the researcher's involvement at the health facility over a long period of time. This usually meant assisting the health provider by giving required medications, performing weight measurements or documenting findings on the ANC card or in clinical records based on directions from the provider. On one occasion the researcher was asked to do a full ANC visit for one of the women independently which was checked by the health provider. Such instances were noted and documented in the reports, and taken into consideration for analysis.

A total of 88 in-depth interviews were conducted, scheduled within 1-2 weeks of women's clinic visits and after birth (in total between 5-7 interviews per woman). Interviews lasted 1-3 hours and took place at the women's home or a location of their choosing. Interviews were recorded and performed by ASM and SP in Kiswahili and a translator assisted where necessary. Every interview started with description of and reflection on the previous ANC visit or birth experience (whether at home or in the health facility). Medical and obstetric history, including last normal menstrual period and information on previous pregnancies, as well as current symptoms and complaints were also asked by the researchers during these interviews. During the interview, the ANC card was reviewed and findings from the ANC card were documented separately. Our observations and the information provided on the ANC card sometimes prompted discussion with women. The number of interviews with each woman (5-7) allowed us to ask for clarification or further exploration of previously discussed events. During observations at the clinic, women's records from the reporting books at the ANC clinics or in the admission records for a facility birth were reviewed, if applicable. Frequent contact with the health providers at the health facilities, including formal and informal conversations, helped to contextualize some of the findings and provide deeper understanding for the perceived drivers and challenges of care provision.

Study instruments

Pre-tested observation checklists were used as a reference to standard of care. We made use of a modified version of the Maternal and Newborn Quality of Care Survey for ANC developed by the Maternal and Child Health Integrated Program (MCHIP)[13]. The focused ANC model, which has four required ANC visits, was used as a care standard for each visit, which is also in accordance with Tanzanian ANC guidelines. The checklist was not filled in during the observations at the health facility, but completed afterwards based on the observation reports for each visit, supplemented by information received from women directly and/or her ANC card.

Indicators

We focused on the following care process indicators for ANC:

- *Last normal menstrual period (LNMP):* Early in the research process we identified that the LNMP was not always documented nor obtained adequately from the women during their first ANC visit. Therefore, we made considerable effort during the interviews to confirm the documented LNMP or to get a reliable estimate of each woman's LNMP using the following process:
    - If women were confident about their LNMP, we used the date they provided. We specifically asked if the date was the first day of her period.
    - If women were unsure about the exact date of the LNMP, we attempted to identify a range of dates in a month, specifically the beginning or end of the month, which we tried to narrow down together. We used a pregnancy wheel to confirm the LNMP using estimated time of conception based on women's partner's presence at home, the first signs of quickening, women's first experience of pregnancy symptoms, and the findings of the fundal height measurement of the first ANC visit.
    - If it was not possible to identify a specific date, we estimated the date to be in the middle of the month that was most likely when she had her last normal menstruation. We always considered a range of 2 weeks before and 2 weeks after the estimated date. This process was also used if the date women reported did not match the other findings from the physical examination or history taking. We considered women's menstrual history and contraceptive use as well.
- *Estimated Date of Delivery (EDD) and GA:* EDD was assumed 280 days after the first day of the LNMP. The gestational age was determined based on the LNMP. With a range of two weeks before and after if it was unsure.
- *SFH, Blood Pressure, weight measurement, laboratory investigation and medication provided:* We relied on the documented findings as reported by the health providers. If certain services were documented but not performed during observations or as reported by the women, we documented those as not performed.
- *Partograph use* (Yes/No), *Oxytocin provision* (Any), *neonatal outcome* (Gender, birthweight, Apgar score) *and maternal outcome* (blood loss)*:* These were taken from the woman's antenatal card for those women who gave birth at the health facility and this was supplemented with information from observations, if available.

Data analysis

Analysis of the observed and recorded data was conducted continuously throughout the data collection period by ASM and SP. Towards the end of the data collection period preliminary analysis of the included women revealed data saturation and it was decided not to recruit any more women. For all women, details of the care received, women's experiences and what was documented on the ANC card, were compared over time. For each woman, we developed a summary overview of their ANC care and birth during the current pregnancy. We compared this to the standards of care and identified any sub-standard care factors. We specifically looked at the quality of assessment of the GA, SFH measurement, weight measurement and newborn birth weight and outcome. We also reviewed all cases together with an expert team, including a Tanzanian gynaecologist (RK) and several

nurse/midwives. To identify if the care provided was sufficient to be able to identify pre-term birth, abnormal foetal growth or possible growth restriction, we used the Intergrowth-21st symphysis-fundal height calculator to monitor growth based on the SFH recorded and GA based on the LNMP[14]. Birth weight, as recorded on the antenatal card, was compared to the Intergrowth-21st newborn size standard for girls or boys[15].

Data validity and trustworthiness

Our selection of sites, sampling approach and sometimes active involvement of researchers in the facilities may have caused bias, but did not affect the quality of the collected data material. We used several strategies to remedy potential bias and minimize possible validity threats ensuring trustworthiness of our data[16]. Our long-term involvement at the health facilities allowed for repeat observations and interviews. Health staff were used to our presence at the facilities and regular visits in women's homes increased familiarity, confidence and mutual trust. We collected rich-data, looking at women's entire pregnancy care, rather than isolated ANC visit allowing for in-depth knowledge about these 13 individual women. Multiple interviews with each woman allowed for clarification and further exploration of themes of interest. We used triangulation of different data collection methods and these were collected using both an insider (participant observation) and outsider view (direct observations, document review).

Results

Women's individual characteristics are presented in Table 1. One woman was a primigravida, six women had their second or third pregnancy, four women were pregnant for the fourth and fifth time, two women were grand multipara with more than five previous births. The majority of women had finished primary education (10/13). Of the 13 women, six women had a facility birth and seven had a home birth. Outcomes for all women are presented in Table 2. Of the facility births, there was one stillbirth, one preterm birth and two term infants died between the age of 3-6 months. All, except for one woman, had at least three ANC visits during their current pregnancy. Three women attended their first ANC visit before 20 weeks. Four women were refused services at least one time due to either not having brought their husband to the first visit or because staff were occupied with training or for other reasons that prevented them from opening the ANC clinic. During 17 of 48 visits women's blood pressure was measured. Five women did not receive any blood pressure measurement during their entire pregnancy. All women, except one, were tested for HIV at least once. Five of 13 women had their Hb checked at least once during pregnancy. One of these five women was anaemic (Hb 9,4mmol) but no follow-up was provided. Nearly all women received adequate prophylactic medication including mebendazol, SP, Folic Acid and Ferro. All women were checked for tetanus vaccination status and provided with a vaccination if indicated.

Four of 13 women had uncertain LNMP (See Table 2). Of the total 48 antenatal visits, during 12 visits (25%) SFH was not recorded on the antenatal card and during 22 visits (46%) the recorded GA was not within range of our determined GA based on the LNMP or was not documented. Eight of 13 women were informed during their final ANC visit that their GA was between 4-8 weeks less than the actual GA based on the LNMP. Only one of these women had an uncertain LNMP. When fundal height was recorded lower than expected, based on the GA or previous recorded SFH, this never led to an extra control or referral. Of the 9 newborns with a known birthweight, 3 were possibly growth restricted or small for gestational age. Two of whom died between the age of 3 and 6 months. One of these infants likely died of complications attributed to asphyxia (Apgar 4 in 1 minute and 6 in 5 minutes). The other infant has unknown cause of death; however, the mother was HIV positive and not on treatment, which might have been a contributing cause.

For Participant 2 (30y), who delivered a preterm baby, the GA and SFH had been documented on her antenatal card during all her five visits, however during birth there was no mention of her delivering a preterm baby, nor were special actions taken after birth. During the interview after her birth, she mentioned that the baby had come earlier than she expected.

Table 1: Overview of individual characteristics

Participant ID (age)	G	P	L	Years in school	Work	Marital status	SES *	Age first birth	Previous birth location	Facility distance
P1 (22y)	2	1	1	11	Yes	Married	3	18	1F0H	1-5km
P2 (30y)	4	2	2	7	Yes	Married	4	22	2F0H	<1km
P3 (25y)	5	4	3	6	No	Married	2	16	1F3H	5-10km
P4 (22y)	2	1	1	7	No	Married	3	17	1F0H	1-5km
P5 (21y)	2	1	0	7	No	Married	1	19	0F1H	5-10km
P6 (18y)	1	0	0	9	No	Relationship	3	-	-	1-5km
P7 (22y)	2	1	1	7	Yes	Relationship	3	14	0F1H	<1km
P8 (29y)	4	2	2	12	Yes	Married	4	24	2F0H	1-5km
P9 (19y)	2	1	0	7	No	Married	3	17	1F0H	>10km
P10 (19y)	3	1	1	7	No	Married	1	16	1F0H	>10km
P11 (32y)	6	5	6	7	No	Married	2	22	3F2H	1-5km
P12 (37y)	8	7	6	5	No	Married	1	16	3F4H	>10km
P13 (31y)	5	4	4	4	No	Married	3	17	2F4H	1-5km

P= Participant, G= gravida, P= Para, L= Living children, SES=socio economic status,
*All women are poor, but category for Socio Economic Status is determined based on a number of indicators including possession of assets, living conditions and personal background. Category levels range from very poor category 1 to more well-off category 4.

Table 3 provides a detailed overview of the care received by Participant 4 (22y) during her ANC visits, notes of her hospital admission and outpatient department visits during her pregnancy. These two visits were not documented on the antenatal card. During her third ANC visit she complained of a stomach ache to the attending nurse. This visit was a few hours before she delivered, what was recorded as, a macerated stillbirth. The nurse claimed this was normal as the baby was starting to descend into the birth canal. During the physical examination of the stomach, she had been informed that the baby was 'anacheza vizuri' (playing well inside), meaning fetal movements were present and the baby was fine. A few hours later she delivered a stillbirth.

Discussion

This study sought to understand the use of SFH measurements and GA estimation during antenatal care in rural Tanzania and its value to identify foetuses at risk for poor outcomes. Our findings reveal that antenatal care for all participating women was sub-standard. None of the women received all the services which are recommended during antenatal care. Attempts to assess or determine the GA and SFH measurements, however, were nearly always performed, as was weight measurement. Deviations from expected normal pregnancy progress based on these assessments however, never had any consequences. Three possible growth restricted infants (with birth weight below P10), of whom two died before the age of 6 months, were not identified. Also, the women with stillbirth and pre-term birth were not identified, despite them regularly making use of health services.

Due to the small sample size in this study, findings cannot be generalized. However, the level of detail provided for each individual woman increases our understanding of the quality of care that these women received during pregnancy. Quality of care assessments of clinical processes can be done by making use of a variety of methodologies. These include medical record reviews (audit), staff interviews (provider assessment), interviews with patients (exit interviews), equipment/supplies checklist (facility survey) and direct observations. The latter is seen as the golden standard because of the relative high sensitivity and specificity of this methodology[17]. Direct observations, however, are limited in that they cannot be double checked against what the health provider has found and if the care indeed was according to evidence based standards and focused on individual patient needs. There are ethical challenges with regard to performing 'double care' in order to check if the findings of the care provided were accurate and if decision making was adequate based on the clinical findings. To come closest to understanding if care provided is of good quality, one needs to triangulate information from a variety

Table 2: Overview of obstetric history, health seeking behaviour, foetal growth parameters and outcomes

ID (age)	Relevant history	Previous birth weights (kg)	LNMP	ANC visit at GA	SFH in cm (per-centile*)	Weight (Kg)	GA at birth	Location of birth	Apgar Score	Newborn weight (kg)	Newborn Outcome
P1 (22y)	-	2.7	Sure	ANC 1: 23+0 ANC 2: 27+1 ANC 3: 32+0 ANC 4: 39+6	23 (p56) 20 (P0) 26 (P0) 30 (p0)	55 55 54 60	40+3	District Hospital	9/10	2.5 (P3)	Female Alive
P2 (30y)	1x Sp. Abortion 3/12	3.0-3.5	Sure	ANC 1: 13+0 ANC 2: 21+5 ANC 3: 26+1 ANC 4: 30+4 ANC 5: 33+6	13 (-) 20 (p17) 24 (p13) 28 (p12) 34 (p69)	53 62 60,5 62 61.5	34+3	District Hospital	8/10	2.5 (p70)	Female Alive
P3 (25y)	1x child death >1y	2.0-4.0	Sure	ANC 1: 9+2 ANC 2: 13+5 ANC 3: 22+1 ANC 4: 26+5 ANC 5: 35+2	- 11 (-) 24 (p91) 25 (p20) 27 (p0)	48 44 43 54 55	37+1	District Hospital	9/10	3.0 (p60)	Male Alive
P4 (22y)	-	unknown	Sure	ANC 1: 26+4 ANC 2: 32+5 ANC 3: 35+5	24 (p9) 26 (p0) no FH	66 71 65	35+5	Health Centre	0/0	2.9 (p75)	Unknown gender Stillbirth
P5 (21y)	1x Twin neonatal death, HIV+ not on ARV	unknown	Sure	ANC 1: 29+1 ANC 2: 33+4 ANC 3: 38+1 ANC 4: 40+2	28 (p34) 21 (p0) 32 (p1) 32 (p0)	54 56 57 56,5	41+1	Health Centre	8/10	3.0 (p10)	Male Alive (died at 3 months)
P6 (18y)	-	-	Sure	ANC 1: 26+0 ANC 2: 31+1 ANC 3: 36+1	20 (p0) 30 (P36) 34 (p30)	59,4 61 64	40+1	District Hospital **	4/6	3.0 (p11)	Male Alive (died at 6 months)
P7 (22y)	-	2.8	Unsure	ANC 1: 29+0 ANC 2: 33+3	26 (p17) 24 (p0)	60 58	40+4 (38-42)	Home	-	3.7 (P70)	Male Alive
P8 (29y)	1x Sp. Abortion 2/12	2.5-3.5	Unsure	ANC 1: 27+3 ANC 2: 31+6 ANC 3: 36+4	20 (p0) 27 (P1) 34 (p24)	59 60 61	41+1 (39-41)	Home	-	3.5 (p60)	Female Alive
P9 (19y)	1x stillbirth	unknown	Sure	ANC 1: 17+4 ANC 2: 22+1 ANC 3: 27+0 ANC 4: 34+0	No SFH No SFH No SFH No SFH	58 59,5 58 61	37+5	Home	-	Unknown	Female Alive
P10 (19y)	1x Sp. Abortion 3/12	2.6	Unsure	ANC 1: 23+1 ANC 2: 28+0 ANC 3: 34+4	no SFH no SFH 28 (p0)	55 59 -	37+3 (36-38)	TBA home	-	Unknown	Female Alive
P11 (32y)	1x twin delivery	2.5-3.5	Sure	ANC 1: 22+0 ANC 2: 31+0 ANC 3: 35+4 ANC 4: 39+5	16 (p0) 27 (p2.5) no SFH no SFH	65 76 74 74	41+3	Home	-	3.7 (p70)	Female Alive
P12 (37y)	1x child death >1y HIV+ on ARV	2.6-3.8	Sure	ANC 1: 20+5 ANC 2: 24+6 ANC 3: 28+4 ANC 4: 32+5 ANC 5: 37+2	18 (p5) 24 (p36) 28 (p45) 32 (p49) no SFH	50 52 55 56 54	41+1	Home	-	Unknown	Female Alive
P13 (31y)	-	3.5	Unsure	ANC 1: 24+2 ANC 2: 31+0 ANC 3: 35+3	no SFH 28 (p8) no SFH	51 - 56	38+3 (37-39)	Home		Unknown	Female Alive

P = Participant, Sp = Spontaneous, LNMP = Last Normal Menstrual Period, ANC = Antenatal Care, GA = Gestational Age, SFH = Symphysis Fundal Height,

* Percentile based on the Intergrowth-21

** Transfer from health center to hospital

Table 3: Antenatal care received by P4 (22y)

P4 (22y) G2P1	GA*	FHR	Weight (Kg)	GA/SFH on card	BP	Lab	Medication
ANC visit 1	26+4	+	66	20/24	-	HIV (O/S)	Fe, SP
ANC visit 2	31+5	+	71	24/26	-	-	Fe,
Hospital Admission	Admission during pregnancy (GA 35) in health facility because of diarrhea and vomiting and diagnosed with malaria, typhoid and UTI for which she received treatment						
OPD visit	Visited OPD in dispensary (GA 35) because of painful breasts. Nurses told her it was normal and sent her home. She was not sure if she felt fetal movements at that time.						
ANC visit 3	35+5	+	65	-	-	-	

* This is the GA based on sure LNMP

of different methods and confirm the findings. This needs to be done within what is considered reasonable and without causing an additional burden on the patient. Such an approach is highly resource intensive and will rarely be possible at a larger scale to generate sufficient power. Nevertheless, it can help to reveal important clinical care processes and decisions made, which can inform how care is provided to women on a day to day basis at selected health facilities. We therefore believe the triangulation of methods in this study is a strength.

Growth monitoring and identification of foetuses at risk (e.g SGA, FGR) is essential in order to reduce the high numbers of stillbirths and newborn deaths in low income settings such as Tanzania[3,4]. SFH measurement are still recommended as a low cost, non-invasive and simple method to screen for foetuses at risk, although there is a lack of evidence[6]. The findings in this study suggest that improvements in clinical performance are needed for SFH measurement to become clinically relevant. Poor determination of GA and lack of analytical assessment of findings limited accurate growth monitoring. SFH and weight measurement appeared to be done and documented more out of habit rather than instrumental for clinical reasoning, similar to previous findings[11]. In part this poor performance is caused by lack of time and space to ensure adequate history taking in an overloaded antenatal clinic where health providers often have several responsibilities simultaneously. Additional challenges might be related to lack of perceived referral options, if health providers through their clinical examination suspect a growth-restricted infant. Previous studies have shown that women rarely follow-up on referral advice from primary care clinics due to financial constrains[18]. There have also been experiences of women not receiving care at the referral facility. This can demoralize health providers at the primary care level, further reducing their interest in performing certain examinations.

Despite the local challenges with providing adequate antenatal care, this study highlights the need to improve nurse-midwife ability to correctly identify a more reliable GA. Ideally, this requires individual continuity of care, availability of tools, such as a pregnancy wheel, and more time allocated for first time visits, which is unlikely to be possible in all health facilities due to infrastructure, resource and staffing problems. In their recent recommendations, the WHO now recommends an ultrasound screening in week 12 to 20 to determine the expected date of delivery[6]. Some studies argue against widespread use of ultrasound screening in low-resource setting, considering the resources needed, need for additional skills training and some studies showing lack of effect[19,20]. However, obtaining early screening might assist health providers in primary care settings to have more confidence in their clinical findings, and might help to argue for referral to a higher level of care[21]. Additionally, it might offer pregnant women more security and ability to advocate for adequate help in case of, for example, preterm labour[22]. Major system challenges remain that will hinder adequate identification of foetuses at risk for FGR. To reduce the high number of neonatal deaths and stillbirths more efforts are required to improve care during pregnancy. More research is needed to determine how SFH measurement and GA assessment can be

improved and if early ultrasound screening for determination of GA is feasible in low-resource settings.

Conclusion

This study has shown that GA assessment and SFH measurement are frequently done during antenatal care. However, these assessments seem to be done more out of habit rather than for foetal growth monitoring. SFH measurements that did not fit the expected GA did not result in extra controls or referral. Additionally, the three possible growth-restricted infants were not detected during antenatal care. Even though determination of GA through LNMP and SFH measurement are relatively simple, low-cost interventions, improvements are needed to ensure the quality of those assessments. To strengthen its clinical relevance for identifying potential pre-term birth and FGR, appropriate referral and follow-up options need to be available as well.

Acknowledgements

We would like to thank the health providers and health administrators at the health facilities for welcoming us to perform our study. We also would like to thank the members of the expert team for their time and effort.

Ethical approval

National Institute of Medical Research in Tanzania (MR/53/100/103-349-399) and the Norwegian Social Science Data Service (44482/3/MHM) granted ethical approval. Nurse/midwives and participating women gave written informed consent. Because of the sensitivity of the study we ensured anonymity in note-taking, pseudonyms were used for all participant names and identifiable details about the district and facilities are not included in this paper. Throughout the research period we developed good relationships with each of the participating women. This also meant that the researchers shared personal perspectives, experiences and reasons for conducting the research. The close involvement of the researchers with the women naturally influenced aspects of care seeking and care provision. Many women were in vulnerable circumstances, which meant that we, at times, became advocates for them to seek and receive care. We provided women with medical advice and supported them to access necessary medication or transport if they could not afford this. In such circumstances the objectives of the research were secondary to safeguarding the health of the participants within possible means.

Funding

ASM was supported by the Research Council of Norway through the Global Health and Vaccination Programme (GLOBVAC) for her PhD, project number 244674. The funding body had no role in the design of the study and collection, analysis, and interpretation of data, nor in the writing of the manuscript.

Contribution of authors

ASM designed the study, ASM and SP collected the data, RK provided local expert advice, TM and JS supervised the study and assisted with analysis. All authors approved the manuscript.

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