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Use of and barriers to maternal health services in southeast Chad: results of a population-based survey 2019

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ABSTRACT

Objectives Chad reports the second highest maternal mortality worldwide. We conducted a survey in Sila region in southeast Chad to estimate the use of maternal health services (MHS) and to identify barriers to access MHS.

Design Retrospective cross-sectional, population-based survey using two-stage cluster sampling methodology. The survey consisted of two strata, Koukou Angarana and Goz Beida district in Sila region. We conducted systematic random sampling proportional to population size to select settlements in each strata in the first sampling stage; and in the second stage we selected households in the settlements using random walk procedure. We calculated survey-design-weighted proportions with 95% CIs. We performed univariate analysis and multivariable logistic regression to identify impact factors associated with the use of MHS.

Setting We interviewed women in selected households in Sila region in 2019.

Participants Women at reproductive age, who have given birth in the previous 2 years and are living in Koukou Angarana and Goz Beida district.

Primary outcomes Use of and access barriers to MHS including antenatal care (ANC), delivery care in a health facility (DC), postnatal care (PNC) and contraceptive methods.

Results In total, 624 women participated. Median age was 28 years, 95.4% were illiterate and 95.7% married. Use of ANC, DC and PNC was reported by 57.6% (95% CI: 49.3% to 65.5%), 22.5% (95% CI: 15.7% to 31.1%) and 32.9% (95% CI: 25.8% to 40.9%), respectively. Use of MHS was lower in rural compared with urban settings. Having attended ANC increased the odds of using DC by 4.3 (1.5–12.2) and using PNC by 6.4 (3.7–11.1). Factors related to transport and to culture and belief were the most frequently stated access barriers to MHS.

Conclusion In Sila region, use of MHS is low and does not meet WHO-defined standards regarding maternal health. Among all services, use of ANC was better than for other MHS. ANC usage is positively associated with the use of further life-saving MHS including DC and could be used as an entry point to the community. To increase use of MHS, interventions should include infrastructural improvements as well as community-based approaches to overcome access barriers related to culture and belief.

Strengths and limitations of this study

► We conducted a representative population-based survey regarding use of maternal health services and access barriers to healthcare in southeast of Chad, a hard-to-reach region with scarce information on maternal health.

► Conducting a household survey instead of a health facility-based survey enabled the inclusion of women that are currently not reached by available services.

► Using a structured questionnaire, we were able to identify the perception of not being sick enough as a main barrier to access care and the use of antenatal care as impacting on the uptake of further services in the maternal health continuum, both findings having direct implications for future locally adapted service provision.

► Retrospective data collection on the use of maternal health services among women may have led to recall and desirability bias.

► Data collection on access barriers was limited to participants not using health services and did not include information about barriers encountered by those already using maternal healthcare service, thus foregoing insight on strategies to overcome existing barriers.

INTRODUCTION

In 2017, nearly 300 000 mostly preventable maternal deaths were reported worldwide.[1 2] Despite important progress made regarding maternal health, with a reduction in global maternal mortality by 38% in the period from 2000 to 2017, it remains a critical health issue.[1–3] According to the World Health Organisation (WHO) the main barriers to access maternal healthcare and contributing factors of maternal mortality are poverty, physical distance to healthcare service, lack of information on service availability and health risks, inadequate services and cultural beliefs and practice.[3] Addressing these

barriers to decrease global maternal mortality was part of the Millennium Development Goals signed in 2000 and of the Sustainable Development Goals adopted by WHO in 2015.[4 5] Several evidence-based WHO-guidelines for pregnancy, childbirth and the postnatal period have been developed to set standards of care for improving maternal health worldwide.[6–8] According to these guidelines eight antenatal visits are recommended and should include nutritional interventions, maternal and fetal assessments and context-specific preventive measures. For childbirth, essential and emergency intrapartum care by qualified healthcare workers is key to reduce maternal mortality. Regarding the postnatal period, a first medical check-up is recommended within 24 hours after birth and should be followed by three postnatal visits within 6 weeks after birth.[7]

Not all countries profited from the global reduction of maternal mortality; currently, 94% of all maternal deaths occur in low and lower middle-income countries.[2] Chad has the second highest maternal mortality ratio worldwide.[9] In 2018 WHO estimated the maternal mortality ratio to be 856 deaths per 100 000 live births for Chad.[3 10] The most recently published estimates regarding maternal health in Chad were collected in 2014–2015 as part of the last national survey on demographics and health (DHS14/15). According to those estimates, maternal deaths account for 45% of all deaths among women of reproductive age (15–49 years).[11] In Chad, coverage of maternal health service (MHS) at national level is low, with 64% of women reporting use of antenatal care (ANC), 24% reporting use of delivery care in a healthcare facility (DC) and only 22% reporting use of postnatal care (PNC) in 2014–2015.[1 11] In addition to coverage of MHS, gender-related inequalities are associated with maternal mortality.[12] Chad ranks 187 out of 189 countries regarding the Human Development Index and ranks 160 out of 162 countries in terms of gender inequalities.[10] Results of the DHS14/15 confirm gender-related inequalities[11]: The level of literacy is much lower among women (22%) compared with men (54%) and only 14% of women receive a secondary-level education compared with 33% of men.[11] Use of MHS differs according to level of education and region.[11]

Sila region is located in southeast Chad and had an estimated population of 526 290 inhabitants in 2018. More than 90% of the population lives in rural settings.[13] The population's main sources of livelihoods are agriculture and livestock.[14] Heavy seasonal rainfalls adversely impact on livelihoods and is resulting in seasonal food insecurity and malnutrition.[14 15] In 2019 the Chadian government imposed a state of emergency on the region due to increasing instability and violence mainly caused by intercommunal clashes between farmers and pastoralists.[15] Seasonal conditions and the current security situation adversely impact on access to healthcare in the region. Furthermore, health service provision in the region is limited in quantity and quality.[16 17] According to the latest national evaluation on obstetrical and neonatal care there are nine health facilities for maternal healthcare in Sila region, one provincial hospital, two district hospitals and six health centres.[17] Among those only one facility meets the conditions of comprehensive emergency obstetrical and newborn care, needed for severe, potentially life-threatening conditions during pregnancy, birth and the neonatal period.[17] Five of the nine facilities are located in urban settings.[17]

Since 2003, Médecins Sans Frontières (MSF) has been present in various districts in Chad implementing health projects for primary and secondary healthcare, malnutrition, malaria and emergency response.

Despite the need for action regarding improvement of maternal health in Chad, information about utilisation of MHS and barriers to access service is limited.

Therefore, MSF conducted a population-based survey in Sila region, to estimate the use of MHS and to identify barriers to access MHS in early 2019. The survey aimed to provide a detailed description of maternal health in the region in order to prioritise activities.

METHODS
In early 2019 (21 January 2019 to 07 February 2019) MSF in collaboration with the Chadian Ministry of Health performed a cross-sectional, retrospective, population-based survey using two-stage cluster sampling methodology in Koukou Angarana and Goz Beida district, located in the Chadian Sila region. The objectives of the survey were to estimate the use of MHS and to identify barriers to access MHS.

Research question and primary outcomes
The study's two main research questions were:
► What is the current utilisation rate for ANC, DC, PNC and contraceptive methods (CM) among women in reproductive age in Goz Beida and Koukou Angarana district?
► What are the main experienced or perceived barriers to access MHS among women in reproductive age in Goz Beida and Koukou Angarana district?

We defined following primary outcomes to answer the research questions:
► Reported proportion of utilisation of ANC, DC, PNC, and CM within the last 2 years among women in reproductive age living in Goz Beida or Koukou Angarana district.
► Reported proportion of experienced or perceived barriers to access ANC, DC, PNC and CM within the last 2 years among women in reproductive age living in Goz Beida or Koukou Angarana district.

Study population and area
Koukou Angarana and Goz Beida are two districts in Sila region. In an exploratory field visit by MSF to Sila region in late 2018, the two districts were identified as the areas in Sila region with the biggest need for intervention and therefore chosen as the study area. According

to population data from the district Ministry of Public Health in 2018, more than 80% of the population in Sila region lives in Koukou Angarana and Goz Beida district.

The study population consisted of women at reproductive age, living in Koukou Angarana and Goz Beida district and who have given birth in the last 2 years. According to the 2017 Chadian national census projections, which are based on the Chadian general population census conducted in 2009, the proportion of women at reproductive age was estimated to be 21.8% of the population in Sila Region.[18] Population figures for the settlement-level were obtained from the estimates produced by the district Ministry of Public Health (MPH) representative. These figures were derived from estimates produced during a bed net distribution and seasonal malaria prophylaxis campaign which took place in 2017.

Sampling and sample size

For the first stage of sampling, we selected settlements using probability proportional-to-size (PPS) sampling. For the PPS, a list of settlements with population figures at settlement-level was obtained from estimates produced by the district MPH representative. According to the provided estimates there were 330 settlements in Koukou Angarana district and 620 in Goz Beida district. In the second stage of sampling, we selected households in the settlements using random walk procedure as an adaptation of the WHO guidelines for cluster vaccination coverage surveys.[19]

We based the sample size calculation on the estimated prevalence of utilisation of ANC of 58.5% in Sila region[9] aiming for a precision of 7.5%, assuming a design effect of 1.5 and non-response of 10%. For calculation of the sample size we used ENA software for SMART.[20] According to this calculation a total of 315 women in each district (Goz Beida and Koukou Angarana) needed to be included in the sample. We selected 45 clusters in Goz Beida district and 45 clusters in Koukou Angarana district consisting of seven households each. We included one woman per household. Women were eligible for inclusion if they satisfied all of the following criteria: member of the selected households, being at least 15 years old, had given birth (live or stillbirth), living in Goz Beida or Koukou Angarana district in the previous 2 years and provided informed consent for herself and by the head of the household. If multiple women were eligible for inclusion in one household, we selected one woman per household at random.

Questionnaire, variables and definitions

The survey questionnaire on maternal health consisted of 69 closed questions including demographic data and data regarding ANC, DC, PNC and CM as primary outcomes. The questionnaire was based on the main indicators identified as relevant and actionable by MSF. Additionally, within the questionnaire we used same questions as the latest national survey on demographics and health (DHS14/15) and as comparable studies within the region.[16 21 22] The questionnaires were translated from French to Chadian Arabic and back translated to French to ensure consistency.

Demographic data were collected on age, marital status, level of literacy, pregnancy status and live and stillbirths in the past 2 years and nutrition status of women being pregnant or lactating at time of the study. For each type of service used (ANC, DC, PNC), we collected data on type of attendant (skilled or traditional) and payment of services.

Additionally, service-specific data were collected. For ANC, we collected the number of ANC visits per pregnancy and if ANC visits included blood pressure measure, tetanus and malaria prophylaxis. For DC, we collected additional data about mode of transport and time to a health facility.

Regarding CM, we collected data on knowledge about CM, use of CM and preferred method among those who had never used any CM.

For any service not used, we asked about barriers to access care. For barriers to access DC, multiple answers were possible.

We used the following definitions: *Women of reproductive age:* Women aged 15–49 years were defined as women of reproductive age. *Literacy:* Being able to read a phrase written on a piece of paper. *Nutrition status in pregnant and lactating women:* Severe acute malnutrition: mid-upper arm circumference (MUAC) of <185 mm; moderate acute malnutrition: MUAC 185–<230 mm. *MHS:* Includes ANC, DC and PNC. *Use of ANC:* At least one ANC visit during pregnancy. *Complete ANC:* At least one blood pressure check, receipt of malaria prophylaxis and tetanus vaccination during pregnancy. *Use of DC:* Assistance during birth by a skilled birth attendant in a health facility. *Use of PNC:* At least one visit within 42 days of birth.

Urban and rural: Categorisation into urban or rural setting was based on administrative delineations.

We defined and categorised reported barriers to access care retrospectively. We categorising access barriers into five groups according to previously used groups in low-income countries[23] : (i) barriers related to transport, including distance to healthcare facility and security issues; (ii) barriers related to culture, and belief, including belief of not being sick enough to use service, not being the custom to use service, using medications from the market, preference for traditional practitioner, preference of birth at home, lack of trust in the services and not aware of the potential benefit of seeking care; (iii) barriers related to economic factors, including not having money for trip or service fee; (iv) barriers related to family support, including having no time or not time yet, no child care, no one to accompany or no permission; and (v) barriers related to quality of care including no staff at healthcare facility. Answers of not knowing a reason for not using MHS or not understanding the question were categorised as 'others'. The categorisation is available in the online supplemental table 1 .

Training and data collection

We conducted a 3-day training on ethics, survey techniques, sampling method, questionnaires, data collection followed by a 1-day pilot for surveyors including debriefing session afterwards. According to results of debriefing minor changes to the questionnaire were made: changes to answer options, correction of translation errors and improvement of skip patterns of the digital questionnaire.

Data collection took place within the households by interviewing eligible and consenting women.

Surveyors worked in teams of two and collected the data for the study with KoboCollect electronic survey software on tablets. We did not collect personal identifiable data. All data were stored password-protected by MSF Holland. All data will be archived at the MSF Headquarters in Amsterdam for a duration of 5 years after the survey.

Data analysis

Primary outcomes of the study were use of and access barriers to ANC, DC, PNC and CM. In order to calculate correct population level summary statistics, we weighted all analysis for the population of Goz Beida and Koukou Angarana districts and additionally for the number of women in the household. Furthermore, all analyses were conducted accounting for the effect of clustering induced by the two-stage sampling design.[24] Most of the variables were categorical variables grouped according to the answer possibilities given in the questionnaire. Continuous variables were age, number of live and stillbirths within the last 2 years and number of ANC visits. Those were grouped in the following way: age (<29 years; ≥29 years), number of ANC visits (<4 visits; ≥4 ANC visits), number of live births within last 2 years (no live birth within the past 2 years; 1 live birth within the past 2 years, >1 live births within the past 2 years), stillbirths within the last 2 years (no stillbirth within the past 2 years; >1 stillbirth within the past 2 years). All categorical variables were reported as proportions with 95% CIs. For continuous variables, such as age, we determined the mean, median, range and IQR. As part of the descriptive analysis we compared urban versus rural settings. For comparing categorical variables in the two groups we used χ^2 tests with the Rao-Scott adjustment for the complex survey design.[24] Results are presented as proportions, 95% CIs and p values.

We conducted three multivariable analyses using logistic regression to understand factors associated with use of (1) ANC, (2) DC and (3) PNC. For all models we included as independent variables potential influencing factors such as maternal age (<29 years vs ≥29 years; age group split at median age), level of literacy (illiterate vs literate), setting of living (rural vs urban) and history of live births (0, 1, >1 live birth in the past 2 years) and stillbirths (no stillbirths, >1 stillbirth within the past 2 years). For the model regarding DC in a health facility we additionally included 'having ever used ANC' and for the model regarding PNC we additionally included 'having ever used ANC' and 'DC in a health facility'. Results are presented as adjusted ORs, 95% CIs and p values.

All statistical analyses were performed using the complex survey design commands (svy) in the Stata V.15 statistical package.[25]

Consent

Study consent was collected at different levels. The surveyors informed all village heads about the study in Chadian Arabic and asked for written consent before they proceeded to speak to households in the village. Within selected households, the surveyors informed the women about the study objectives and asked for written consent. If the head of the household was different from the woman, his or her written consent was also requested.

Patient and public involvement

No patient involved.

RESULTS

Study population

In total 624 women from the districts of Goz Beida and Koukou Angarana participated in the survey. Of the participating women, 67.7% (451/624) lived in rural settings, while 32.3% (172/624) lived in urban settings (table 1). Among the participating women the mean age was 27.7 years (median 28, IQR 22–32; range 15–45), 95.4% (595/624) were illiterate and 95.7% (595/624) were married. At the time of the survey, 18.0% (124/624) of women were pregnant and 4.2% (28/624) reported a stillbirth in the past 2 years (table 1). Severe acute malnutrition affected 0.7% (1/124) of pregnant women, 0.8% (2/416) of lactating women and no non-pregnant/non-lactating women (table 1).

Moderate acute malnutrition affected 5.3% (7/124) of pregnant women, 3.0% (14/416) of lactating women and no non-pregnant/non-lactating women (table 1).

Overall, use of ANC, DC and PNC was reported by 57.6% (95% CI: 49.3% to 65.5%), 22.5% (95% CI: 15.7% to 31.1%) and 32.9% (95% CI: 25.8% to 40.9%) of women, respectively (table 2).

ANC

Among all respondents, 57.6% (350/624) reported at least one ANC visit, with significantly higher use in urban settings (86.7%; 147/173) compared with rural settings (43.7%; 203/624) (p<0.001, table 2). Only one woman reported having eight visits as recommended by WHO; 15.6% (93/622) of women reported ≥4 visits. In urban settings the percentage of women with ≥4 ANC visits was 32.8% (53/171.), while among women living in rural settings 7.5% (40/451) reported ≥4 ANC visits (p<0.001). Of all respondents who attended ANC, 47.4% (159/350) received complete ANC (table 2). The number of ANC visits was associated with completeness of ANC. The odds of having complete ANC increased by 1.64 (1.30–2.06) with each additional ANC visit. However, 36.2% (34/93)

Table 1 Characteristics of the study population (N=624). Results of a population-based survey 2019 on use of and barriers to maternal health services in the southeast of Chad.

Characteristic		n	%	95% CI
Marital status	Never married	0	–	–
	Married	596	95.7	(93.7 to 97.1)
	Divorced	14	2.1	(1.2 to 3.6)
	Widowed	10	1.7	(0.8 to 3.6)
	Separated	4	0.5	(0.2 to 1.4)
Current status of pregnancy	Not pregnant	500	82.0	(78.8 to 84.9)
	Pregnant	124	18.0	(15.1 to 21.2)
Number of live births in past 2 years	0	10	1.4	(0.8 to 2.6)
	1	487	77.1	(71.8 to 81.6)
	2	119	20.6	(16.2 to 25.9)
	3	6	0.9	(0.4 to 2.0)
Number of stillbirths in past 2 years	0	596	95.9	(93.2 to 97.5)
	1	27	4.0	(2.4 to 6.5)
	2	1	0.2	(0.0 to 1.4)
District	Goz Beida	319	37.7	(35.9 to 39.5)
	Koukou Angarana	305	62.3	(60.5 to 64.1)
Setting	Rural	451	67.7	(56.5 to 77.1)
	Urban	172	32.3	(22.9 to 43.5)
Literacy level	Illiterate	595	95.4	(92.4 to 97.3)
	Literate	29	4.6	(2.7 to 7.6)
Moderate acute malnutrition	Pregnant women	7/124	5.3	(2.5 to 11.0)
	Lactating women	14/416	3.0	(1.6 to 5.4)
	Non-pregnant women	0/84	–	–
Severe acute malnutrition	Pregnant women	1/124	0.7	(0.1 to 7.3)
	Lactating women	2/416	0.8	(0.2 to 3.5)
	Non-pregnant women	0/84	–	

of women reporting ≥4 ANC visits still received incomplete ANC care. There was no difference with regards to completeness of ANC between rural and urban settings (table 2). Most women reported consulting a midwife (43.9%; 163/350) for ANC (table 3).

In multivariable logistic regression model the adjusted odds of having an ANC visit during pregnancy was 8.6 times (95% CI: 3.5 to 21.1) higher among those women living in urban settings compared with those living in rural settings. Other factors included in the model had no statistically significant impact on the odds of having ANC (table 4).

DC

Overall, 22.5% (134/624) of women reported using DC (table 2). This proportion was significantly higher in urban settings (57.5%; 103/173) compared with rural settings (5.8%; 31/451) (p<0.001; table 2). In adjusted analysis, the odds of using DC was 15.8 (6.9–36.1) times higher for women living in urban settings compared with those in rural settings and 4.3 (1.5–12.2) times higher for

women having used ANC during pregnancy. The odds were 0.5 (0.25–0.93) times lower for women ≥29 years old compared with those <29 years old (table 4). Most women reported support during delivery by an untrained traditional birth attendant (TBA) outside a health facility (59.7%; 374/624) while only 18.2% (108/624) reported assistance by a midwife, nurse or doctor (table 3). The proportion of women reporting support by a TBA was significantly higher in rural settings (78.5; 352/451) than in urban settings (32.0; 51/173) (p<0.001). In contrast a significantly higher proportion of women in urban settings reported of support by a skilled attendant (57.9%; 104/173) than in rural settings (7.0; 38/451) (p<0.001). Payment for DC within a health facility was reported by 68.3% (90/134) of women. Payment for support during delivery outside a health facility was reported by 78.0% (373/490) of women. The proportion of women reporting payment for service during delivery did not statistically differ between formal and non-formal healthcare setting (p=0.154) and also did not differ between urban and rural settings (p=0.275).

Table 2   Use of maternal health services in Sila Region as reported by participating women (N=624). Results of a population-based survey 2019 on use of and barriers to maternal health services in the southeast of Chad.

Maternal healthcare service											P value*
	Rural			Urban			Total				
	n	%	95% CI	n	%	95% CI	N	%	95% CI		
Use of antenatal care (N=624)											
No antenatal care visit	248	56.3	47.9 to 64.4	26	13.3	6.4 to 25.8	274	42.4	35.4 to 50.7		<0.001
Any antenatal care visit	203	43.7	35.6 to 52.1	147	86.7	74.2 to 93.6	350	57.6	49.3 to 65.5		
***Complete antenatal care* (including blood pressure, malaria prophylaxis, tetanus vaccination) (N=350)**											
Incomplete	110	53.1	44.2 to 61.9	81	52.1	38.7 to 65.1	191	52.6	44.6 to 60.5		0.896
Complete	93	46.9	38.1 to 55.8	66	47.9	34.9 to 61.3	159	47.4	39.5 to 55.4		
***Number of antenatal care visits* (N=622)†**											
<4 antenatal care	411	92.5	88.8 to 95.1	118	67.2	58.1 to 75.1	529	84.4	79.3 to 88.4		<0.001
≥4 antenatal care	40	7.5	4.9 to 11.2	53	32.8	24.9 to 41.9	93	15.6	11.6 to 20.7		
Use of delivery care in a health facility (N=624)											
No delivery care	420	94.2	91.2 to 96.3	70	42.5	27.3 to 59.3	490	77.5	68.9 to 84.3		<0.001
Delivery care	31	5.8	3.7 to 8.8	103	57.5	40.7 to 72.7	134	22.5	15.7 to 31.1		
Use of postnatal care within 42 days after birth (N=624)											
No postnatal care visit	358	81.2	73.3 to 87.0	67	37.6	27.3 to 49.1	425	67.1	59.1 to 74.2		<0.001
Any postnatal care visit	92	18.8	13.0 to 26.3	106	62.4	50.9 to 72.7	198	32.9	25.8 to 40.9		

*Comparing proportions of reported barriers between rural and urban setting using χ^2 test adjusted for the complex survey design (Rao-Scott method (24)).

†2/624 women provided no answer on number of ANC visits during pregnancy.

Overall, the main reported mode of transport to reach a facility was walking, reported by 53.4% (73/133) women. Taking a moto was reported by 25.8% (34/133), transport by donkey or horse by 12.1% (15/133), taking a vehicle by 7.9% (10/133) and being carried by 0.8% (1/133) of women. The mode of transport to facility did not significantly differ between women living in rural settings compared with urban settings (p=0.088). Regarding the time of transport, 81.0% (95/118) of women reported to have reached a facility in less than an hour, 10.2% (12/118) in 2 hours, 5.8% (7/118) in 3 hours, 1.5% (2/118) in half a day and 1.5% (2/118) in more than 1 day. A lower proportion of women living in rural settings reported transport times of less than an hour (73.5%; 21/29) compared with women in urban settings (82.7%; 74/89) (p=0.055).

PNC

Among all women, 32.9% (198/624) reported a PNC visit within 42 days after birth (table 2). The proportion of women without PNC visit was significantly higher (p<0.001) in rural (81.2%; 358/450) than in urban settings (37.6%; 67/173) (table 2). Most often a midwife

was consulted for PNC (46.6%; 93/198) (table 3). In multivariable analysis, the adjusted odds of having PNC visit was 22.4 (1.3–4.5) times higher among those living in urban settings compared with those living in rural settings. Furthermore, adjusted odds for having PNC was 6.4 (3.7–11.1) times higher for women having used ANC compared with those not having used ANC and 3.4 (1.7–7.0) times higher for women reporting DC in a healthcare facility compared with those without DC (table 4). All other potential influence factors included in the model did not show statistical association.

Barriers to care

Regarding barriers of access to care the three most commonly reported types of access barrier to any type of MHS were related to transport, factors related to culture and belief and economic factors (table 5 and online supplemental table 1).

For ANC, transport issues, factors related to culture and belief and economic factors were reported by 44.1% (118/274), 35.4% (93/274) and 14.4% (42/274) of women, respectively (table 5). With regards to DC, 33.3% (218/653) of women reported transport issues as

Table 3 Type of professional consulted for maternal health service in Sila region as reported by participating women (N=624). Results of a population-based survey 2019 on use of and barriers to maternal health services in the southeast of Chad.

	N	%	95% CI
Type of professional consulted for antenatal care for those reporting use of antenatal care visit (N=350 women*)			
Midwife	163	43.9	33.0 to 55.4
Nurse	153	38.6	29.7 to 48.3
TBA—inside health facility	68	16.9	11.3 to 24.5
TBA—outside health facility	2	0.5	0.1 to 1.9
Doctor	1	0.2	0.0 to 1.3
Type of assistance consulted for birth (N=624 women*)			
TBA—outside health facility, untrained	374	59.7	51.7 to 67.2
Midwife	78	13.4	8.1 to 21.3
Relative/friend	69	11.7	8.2 to 16.3
TBA—inside health facility	34	5.3	2.6 to 10.4
TBA—outside health facility, trained	29	3.8	2.3 to 6.1
Nurse	25	4.0	2.1 to 7.5
Doctor	5	0.8	0.3 to 2.0
No one	10	1.4	0.5 to 3.5
Type of professional consulted for postnatal care for those reporting use of postnatal care (N=198 women*)			
Midwife	93	46.6	33.4 to 60.4
Nurse	83	36.3	26.0 to 48.1
TBA—inside health facility	36	16.4	10.0 to 25.9
Doctor	1	0.3	0.0 to 2.3
Do not know	1	0.3	0.0 to 2.3

*Multiple answers possible, i.e. more than one professional could have been present for any given service

TBA, traditional birth assistant.;

main access barriers to care followed by factors related to culture and belief (32.4%; 213/653) and economic factors (27.9% 179/653) (table 5). For the use of PNC, the most commonly reported access barriers to care were factors related to culture and belief (47.2%, 197/425) and transport (33.3%, 145/425). Economic factors as access barrier to PNC were reported by 14.1% (60/425) of women (table 5).

For access barriers to care related to culture and belief, 'not being sick enough' and 'seeking care not being customary' were the most often reported reasons (online supplemental table 1). 'Not being sick enough' was reported by 19.9% (55/274), 20.5% (139/653) and

35.3% (151/425) of women for not accessing ANC, DC or PNC, respectively. 'Not being custom' to use service was reported by 10.9% (24/274), 9.4% (55/653) and 7.4% (24/425) in regards to ANC, DC and PNC, respectively. Seeking care at a traditional practitioner was reported by less than 1% of women for ANC, DC and PNC.

For ANC and PNC proportions of reported barriers to care differed significantly between urban and rural settings (table 5). For ANC, the most common reported barrier in urban settings was related to culture and belief while transport issues were only reported in rural settings (p=0.005; table 5). For PNC factors related to culture and belief were reported as main access barrier in both settings, whereby the proportion was significantly higher in urban settings (65.2%; 41/67) compared with rural settings (43.2; 156/358) (p=0.007; table 5).

Age, number of live births, history of stillbirth and level of literacy had no impact on the type of reported access barriers regarding use of ANC, DC or PNC.

CM

Only 36.8% (228/624) of women reported having heard about CM. There were significantly more women in urban settings (65%; 110/173) who reported having heard about CM compared with rural settings (24%; 118/451) (p<0.001). Among those who reported to have heard about CM, the most often named known method were injectables (52.6%; 194/228) and pills (34.5%; 124/228), without any significant differences between women from urban and rural settings (online supplemental table 2).

Among those who reported to have heard about CM, only 10.8% (26/228) women reported to have ever used any method, and the proportion between urban and rural settings did not differ. Among those who have used CM, use of injectables was most often reported (68.5%; 19/26). There was no difference on type of CM used between women from urban and rural settings.

Among those who reported to have heard about CM but have not used CM, 26.3% (54/202) reported being interested in using CM; using injectable was most frequently named as preferred method (69.1%; 37/54). Among those women who had not used CM but had heard about CM and were interested to use a CM, the most commonly reported reasons for not using CM were lack of knowledge about CM (23.4%; 11/51) and where to find CM (23.4%; 11/51) followed by disagreement by husband (12.4%; 5/51) and too long distance to a health facility (7.6%; 4/51). There was no difference in the proportion of reported reasons for not using CM between rural and urban settings (p=0.651).

Among those who have heard about CM without using CM in the past 2 years and no interest in using CM the main reasons for not being interested in using CM were desire for pregnancy (48.6%; 75/148), use of natural method instead (16.8%; 22/148) and opposition from husband (10.3%; 14/148). The proportion of reported reasons for no demand for CM did not differ between rural and urban settings (p=0.815).

Table 4 Impact of several influence factors on use of antenatal care, delivery care in a health facility and postnatal care in Sila region (N=624) — multivariable logistic regression. Results of a population-based survey 2019 on use of and barriers to maternal health services in the southeast of Chad.

Influence factor	Use of antenatal care			Use of delivery care in a health facility			Use of postnatal care		
	aOR	95% CI	P value	aOR	95% CI	P value	aOR	95% CI	P value
Setting of living									
Rural setting	ref			ref			ref		
Urban setting	8.61	3.52 to 21.07	<0.001*	15.8	6.9 to 36.1	<0.001*	2.4	1.3 to 4.5	0.007*
Maternal age									
>29 years	ref			ref			ref		
≥29 years	0.69	0.46 to 1.05	0.082	0.5	0.2 to 0.9	0.031*	0.84	0.55 to 1.29	0.428
Live births in the last 2 years									
No birth in last 2 years	ref			ref			ref		
1 birth in last 2 years	1.56	0.33 to 7.31	0.567	0.2	0.0 to 2.4	0.209	1.3	0.3 to 6.6	0.737
2–3 births in last 2 years	2.61	0.52 to 13.17	0.243	0.3	0.0 to 4.0	0.360	1.7	0.3 to 9.3	0.549
Stillbirths in the last 2 years									
No stillbirth in last 2 years	ref			ref			ref		
Having a stillbirth in last 2 years	0.64	0.15 to 2.70	0.536	0.9	0.3 to 3.0	0.909	0.69	0.17 to 2.7	0.590
Maternal literacy									
Illiterate	ref			ref			ref		
Literate	2.42	0.75 to 7.85	0.139	3.1	1.0 to 9.9	0.060	2.2	0.7 to 6.9	0.175
Use of antenatal care									
No	n.a.			ref			ref		
Yes	n.a.			4.3	1.5 to 12.2	0.006*	6.4	3.7 to 11.1	<0.001*
Delivery care in a healthcare facility									
No	n.a.			n.a.			ref		
Yes	n.a.			n.a.			3.4	1.7 to 7.0	0.001*

*Statistical significance at p<0.05.
aOR, adjusted odds ratio; n.a., not applicable; ref, reference group.

DISCUSSION

Use of MHS services in Sila region remains far below standard

This survey's results highlight that WHO-recommended standards regarding maternal health[6–8] are still far from being achieved and interventions to improve maternal health are needed in Sila region. This survey provides insight into use of and access barriers to MHS in Sila region and therefore adds valuable information to the scarce knowledge available on the topic for this region. The knowledge gained will be beneficial in guiding the decision-making process regarding region-specific strategies for improving maternal health.

When comparing our results with the findings for Sila region from the last DHS14/15, the use of ANC, which was reported by 57.6% women in our survey did not improve since the DHS14/15 when 58.5% of women in Sila region had used ANC by a healthcare professional.[11] Regarding use of DC our result indicate improvement with an increase from 11.4% in Sila region identified in the last DHS in 2014/15 to 22.5% in 2019.[11] Similarly,

Table 5 Access barriers to maternal health service in Sila region as reported by participating women that did not use the services. Results of a population-based survey 2019 on use of and barriers to maternal health services in the southeast of Chad.

Barriers	Barriers to antenatal care (N=274) n; % (95% CI)			Barriers to delivery care in a health facility (N=490)† n; % (95% CI)			Barriers to postnatal care (N=425) n; % (95% CI)		
	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total
Transport	118; 49.0 (38.3 to 59.9)	0	118; 44.1 (33.7 to 55.0)	198; 35.7 (29.7 to 42.1)	20; 21.2 (14.5 to 29.9)	218; 33.3 (28.0 to 39.1)	137; 38.2 (29.1 to 48.2)	8; 11.0 (5.0 to 22.6)	145; 33.3 (25.4 to 54.8)
Cultural, and belief factors	75; 31.2 (22.0 to 42.1)	18; 72.5 (57.2 to 83.9)	93; 35.4 (26.2 to 45.7)	183; 31.7 (25.0 to 39.4)	30; 35.6 (20.9 to 53.6)	213; 32.4 (26.1 to 39.3)	156; 43.2 (33.8 to 53.2)	41; 65.2 (48.2 to 79.0)	197; 47.2 (38.2 to 56.1)
Economic factors	37; 14.2 (8.5 to 22.8)	5; 16.3 (7.7 to 31.1)	42; 14.4 (9.1 to 22.1)	156; 27.9 (21.0 to 36.1)	23; 27.7 (11.7 to 52.6)	179; 27.9 (21.3 to 35.6)	49; 13.9 (9.1 to 20.7)	11; 15.0 (7.9 to 26.5)	60; 14.1 (9.8 to 19.9)
Family support	8; 2.5 (1.0 to 6.0)	0	8; 2.2 (0.9 to 5.4)	25; 4.0 (2.4 to 6.4)	13; 15.5 (6.8 to 31.7)	38; 5.9 (3.8 to 9.0)	10; 2.9 (1.0 to 7.8)	4; 4.9 (1.7 to 12.9)	14; 3.3 (1.5 to 7.0)
Quality of care	2; 0.8 (0.2 to 3.2)	0	2; 0.7 (0.2 to 2.9)	Not asked for			Not asked for		
Others	8; 2.3 (1.1 to 4.9)	3; 11.2 (3.3 to 31.9)	11; 3.2 (1.6 to 6.2)	5; 0.7 (0.3 to 2.1)	0	5; 0.6 (0.2 to 1.7)	6; 1.8 (0.7 to 4.6)	3; 4.0 (1.4 to 10.8)	9; 2.2 (1.0 to 4.5)
P value*	0.005			0.071			0.007		

*Comparing proportions of reported barriers between rural and urban setting using χ^2 test adjusted for the complex survey design (Rao-Scott method [24]).
†Multiple answers possible.

our results indicate an increase for uptake of PNC from 10.8% in 2014/15 to 32.9% for Sila region.[11] However, despite some progress in the uptake of DC and PNC, the use of MHS in Sila region is still low and recommended WHO-standards are not met.[9 17] Additionally, our survey identified a very low level of knowledge and use of CM. Compared with the findings of the DHS14/15, which found for Sila region a proportion of 56.2% of women who have ever heard about CM, the proportion of women in our survey who have heard about CM was even lower with 36.8%.[11] The proportion of women in Sila region who have ever used any CM slightly increased since the DHS14/15, which found a proportion of 2.4% women who have ever used CM, to 10.2% in our survey but remains on a very low level.[11] Those findings emphasise that future MHS programmes should include family planning as more than 25% of women reported demand for CM.

Infrastructure, previous contact to MHS and literacy influence the use of maternal health services

Our survey confirms significant differences in use of any MHS between urban and rural settings in Sila region.

There is much lower use of services in rural settings compared with urban settings, a fact which has previously been identified at national level.[11] Research had shown that rural populations have lower maternal healthcare coverage.[16 26] This is especially important as 80% of the Chadian population currently lives in a rural setting and it is expected that this proportion will continue to grow based on projection up to 2050.[27 28] Therefore, the focus for future programmes targeting to improve maternal health outcomes should be on rural settings.

We were able to show that previous contact with MHS did improve the future use of MHS; women who attended ANC were more likely to use DC and PNC. Hence, ANC could be a starting point for future interventions as an effective form of health promotion and community engagement aiming to increase use of MHS. The positive impact of ANC on use of DC and PNC was previously shown in a study from Ethiopia, where those who have attended ANC were more likely to use further MHS in the course of pregnancy and motherhood.[29] Despite higher level of use for ANC compared with other MHS, level of completeness of ANC even among those with ≥4 ANC visits was low in Sila region. Therefore, interventions should aim to strengthen ANC in terms of availability and quality to improve use of MHS and consequently reduce maternal mortality.

Future intervention in the field of maternal health needs to account for the high level of illiteracy in Sila region (95%), which is higher than the national estimates (89%).[11] According to previous studies from Chad and Nigeria, educated women were more likely to use MHS.[1 26] Furthermore, according to results of the DHS14/15, 47.3% of women without formal education had no ANC visit compared with 1.2% of women with the highest level of education.[11]

According to our results, there was some, although non-significant, negative impact of literacy on the use of MHS.

Transportation, culture and belief and economic factors were main barriers to care

Regarding access barriers to MHS, this survey identified transport, economic factors and culture and belief as the strongest access barriers.

The importance of access barriers related to transport issues might be explainable by the low number of available health facilities in Sila region overall.[17] This is especially relevant for use of DC given the low number of facilities that are sufficiently equipped for obstetrical and neonatal care in Sila region.[17] According to the latest assessment of emergency obstetrical and neonatal care only 3.9% of all births received care in health facilities and 0.3% in a health facility providing emergency obstetrical and neonatal care in Sila region.[17] Furthermore in rural settings the number of available health facilities is even lower than in urban settings.[17] This might explain that transport as access barrier is especially of importance in rural settings.[13] Therefore, infrastructural improvements regarding number of and accessibility to health facilities, especially in rural areas are needed.

Access barriers related to culture and belief were the second most often reported access barriers to use of ANC and DC and the most often reported access barrier to PNC. For any of the three services the most often given answers, why women have not used particular service, were 'being not sick enough' and 'using the service is not their custom'. Other reasons such as consulting traditional practitioners, no trust in services or not knowing where to go were reported by less than 2% of women for any MHS. These findings indicate that preference for traditional services or mistrust of formal services might be less important in the context of barriers to accessing care than the perceived need for care. For use of ANC and PNC the proportion of women reporting access barriers related to culture and belief were significantly higher in urban than in rural settings. For use of DC the proportion of women reporting culture and belief factors as access barrier did not differ between urban and rural settings. To address access barriers related to culture and belief, community outreach programmes are needed, aiming to promote dialogue with the communities to understand setting-specific reasons to avoid or delay care and ways to overcome these barriers. Economic factors including no money for fee and transport were also reported as important access barriers to care and did not differ between urban and rural settings. However, informal care also involved payment of fees but was not perceived as access barrier in this context.

In order to address all categories of identified access barriers to use of MHS multilevel, setting-specific approaches are needed, as shown in previous findings for other countries in the region.[26 30] We therefore recommend, combining healthcare provision with community engagement to understand access barriers and locally acceptable ways to address these.

Limitations

Our survey has some limitations. Koukou Angarana and Goz Beida district are only representing about 80% of the population of Sila region and are the areas with the biggest need, thus our results are potentially not representative for the whole Sila region. For the cluster allocation sampling frame, we used population estimates derived from a national census conducted in 2009 and, for the village level we used estimates from a bed-net distribution campaign in 2017. Despite the fact that both estimates were adjusted considering growth rates, inaccuracies cannot be excluded, which might result in some bias in the sampling.

As an additional limitation, we have no written record of the refusal rate. Due to the security situation and the resulting time pressure while data were collected, the exact number of women refusing to participate are not available. Therefore, selection bias cannot be excluded. Verbal feedback from interviewers indicated that less than a dozen women refused participation throughout the entire survey.

Furthermore, there is a possibility of recall bias. Although events such as pregnancy and childbirth are perceived to be memorable in general, recall bias cannot be ruled out and needs to be accounted for in the interpretation of the results. There is also a possibility for social desirability bias, where the interviewees might have been more likely to respond in a way that they thought would be viewed more favourably by the study team. In order to reduce this bias, surveyors explained that data collection and analysis was conducted anonymously, responses would be kept confidential and that no individual incentives would be provided for participation in the study.

One additional identified limitation was that only women who have not used MHS were asked about barriers to access care. For an even more complete insight into existing barriers to access care it could be useful in future studies to ask also women who used MHS about their motivation for using MHS and any barriers they encountered and their strategies to overcome those.

CONCLUSIONS AND POLICY IMPLICATIONS

In southeast Chad current use of any MHS is low, especially in rural settings, and does not meet WHO-defined standards regarding maternal health. Among all services, use of ANC was better than for other MHS. ANC could be used as an entry point to communities as we were able to show that use of ANC positively impacts on the use of further services in the maternal health continuum of care. However, despite the higher use of ANC, the quality of available ANC was low. Improving ANC and reducing access barriers to ANC may serve as entryway for DC and consequently reduce maternal mortality. Additionally, improved access to and availability of CM is needed to account for the existing interest in use of CM.

The main access barriers to any service were related to transport issues indicating gaps in the available health infrastructure in the region and to factors related to culture and belief. Programmes tackling changes at different levels are needed to overcome reported access barriers. There is an urgent need for accessible and free services combined with community-based dialogue to overcome cultural access barriers. Furthermore, future programmes need to be specific to setting (rural or urban), as the type of setting was the most influential factor regarding the use of MHS and access barriers to care.

As most of the population of Chad lives in rural settings, maternal health programmes should prioritise adequate models of care for rural communities. These models should be built on community consultations to understand concerns about use and need for care, and should include community-based health promotion and strategies adapted to the level of literacy.

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