Research Square

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Assessment of Antenatal Care Attendance and Determinants of Facility-Based Delivery Among Enrollees of the Kano State Contributory Healthcare Management Agency in northern Nigeria

Rahila Aliyu Muktar
Northwest University, Kano State Contributory Healthcare Management Agency
Zainab Abdulkadir
zmeena2003@gmail.com

Aminu Kano Teaching Hospital
Abdulgafar Lekan Olawumi
Aminu Kano Teaching Hospital
Iman Usman Haruna
Northwest University, Kano
Al-Ameen Harande Yahya
Kano State Contributory Healthcare Management Agency

Research Article

Keywords: Health Insurance, Universal Health Coverage, Antenatal Care, Facility-Based Delivery, KSCHMA, Nigeria

Posted Date: September 20th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11053717/v1

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Additional Declarations: No competing interests reported.

Abstract

Background

In Northern Nigeria, financial and structural barriers contribute to low institutional delivery and delayed initiation of antenatal care (ANC). The Kano State Contributory Healthcare Management Agency (KSCHMA) was established to reduce out-of-pocket expenditure (OOPE) and improve access to essential maternal healthcare. This study assessed ANC utilization, patterns and determinants of place of delivery among women enrolled in KSCHMA in Kano State.

Methods

A cross-sectional study was conducted among 1,080 KSCHMA-enrolled women attending 24 accredited facilities across the three senatorial districts of Kano State. Quantitative data were analysed using SPSS version 26. Binary logistic regression was used to identify factors associated with facility-based delivery.

Results

Only 41.2% of women had at least four ANC visits, while 69.6% initiated ANC late (> 14 weeks' gestation). Most (80.3%) reported no out-of-pocket payment for ANC and delivery. KSCHMA enrolment was almost equally distributed between formal (49.8%) and informal (50.2%) schemes. Despite this financial coverage, only 27.0% of women delivered in health facilities. Informal education was associated with significantly lower odds of facility delivery compared with tertiary education (OR = 0.074, 95% CI: 0.008–0.701; p = 0.023). Rural residence was similarly associated with lower odds (OR = 0.013, 95% CI: 0.001–0.108; p < 0.001). Women with < 4 ANC visits had lower odds of facility delivery than those with ≥ 4 visits (OR = 0.103, 95% CI: 0.029–0.362; p < 0.001). Late ANC booking was also associated with lower odds of facility delivery compared with early booking (OR = 0.228, 95% CI: 0.066–0.791; p = 0.020).

Conclusion

KSCHMA appears to reduce financial barriers to maternal healthcare, but facility delivery remains low. Strengthening primary healthcare infrastructure and ensuring continuous availability of skilled birth attendants are essential to improve institutional delivery and advance universal health coverage in Kano State.

Background

Antenatal care (ANC) is an important public health service that gives pregnant women access to necessary medical treatments and helps ensure that both mothers and the children remain in good health. It enables possible complications of pregnancy to be detected and dealt with early, thus

improving the health outcomes for both mothers and newborns. In Nigeria, although several policy measures have been introduced to improve maternal health services, utilisation of and access to ANC remain notably low [1]. This low level of use of ANC services not only puts maternal and neonatal health at risk but also obstructs Nigeria's attempts to achieve Sustainable Development Goal 3, whose objective is to reduce maternal mortality and improve maternal health by the year 2030 [1].

The World Health Organisation (WHO) states that antenatal care should include at least four visits to healthcare providers, as this frequency is associated with reduced perinatal mortality and improved maternal health outcomes [1, 2]. However, Nigeria has faced considerable difficulties implementing these recommendations, reducing the overall effectiveness of antenatal care and negatively affecting maternal and child health [3].

Since it is the most populous country in Africa, Nigeria has some of the highest rates of maternal and neonatal mortality globally. In 2023, the country was responsible for nearly 20% of all global maternal deaths, the maternal mortality ratio being 814 per 100,000 live births and the neonatal mortality rate 34 per 1,000 live births, both of which are considerably above the global averages [4]. A major reason for these results is inadequate ANC coverage, which hinders the timely identification and control of pregnancy-related health risks [5]. Moreover, Nigeria's total fertility rate was about 5.2 children per woman in 2023, as compared to the global average of 2.3 [4]. This high fertility rate, which is due to cultural and religious beliefs, early marriage, low levels of contraceptive use, and poor access to reproductive health services, particularly in rural areas, has important consequences for population dynamics, economic development and public health systems [6]. Also, the lack of adequate antenatal care increases the chance of undiagnosed complications, such as hypertensive disorders during pregnancy.

National health insurance schemes play an important role in Nigeria's attempt to achieve Universal Health Coverage (UHC); nevertheless, their actual impact on the use of the maternal continuum of care in areas with a high disease burden has not been properly assessed [7, 8].

In Northern Nigeria, structural and financial obstacles make institutional deliveries rare and delay the start of ANC [9–11]. The Kano State Contributory Healthcare Management Agency was established to reduce OOPE and improve access to essential maternal health services. This study examines patterns, adequacy of antenatal care attendance and determinants of place of delivery among women enrolled in KSCHMA in Kano State.

Methods

Study Setting and Design

A facility-based cross-sectional study was conducted in Kano State, northwestern Nigeria. Kano State comprises 44 Local Government Areas (LGAs) with an estimated population exceeding 15 million. The state healthcare system operates on a three-level structure: Primary Healthcare Centres (PHCs)

providing basic preventive and curative care, Secondary General Hospitals offering comprehensive emergency obstetric and newborn care and Tertiary Academic Hospitals. KSCHMA purchases services through a network of accredited public (PHCs and General Hospitals) and private health facilities.

Target Population & Eligibility Criteria

Quantitative Study Population

Women of reproductive age (15–49 years) who meet all of the following criteria:

- Currently enrolled in any KSCHMA scheme (Formal Sector, Vulnerable Group Social Health Insurance Program, or Informal Sector Plan) for at least 12 months.
- Delivered a live or stillborn infant within the preceding 12 months.
- Consented to participate in the study.

Exclusion criteria included women who were not part of KSCHMA at the start of their first pregnancy or who were unable to give informed consent.

Sample Size Determination

The sample size (n) was determined by using Cochran's formula for single proportions in cross-sectional studies.

Where:

- Z = 1.96 (Standard normal deviation at 95% Confidence Interval)
- p = 50.2% (proportion of pregnant women with skilled attendance at birth in Kano) [12]
- d = 0.04(Margin of error, set at 4%)

To account for the multi-stage cluster sampling design, a **Design Effect** of 1.8 was applied:

n = {calculated sample x {adjusted}} = 600.25 x 1.8 = 1,080.45

The final sample size was rounded up to **N = 1,080 respondents**.

Sampling Strategy and Population

A multi-stage stratified selection strategy was deployed across the three senatorial zones of Kano State (Kano Central, Kano North, and Kano South) to ensure representative geographic and urbanisation coverage:

1. **Stage 1 (LGA Selection)**: 12 LGAs were selected using simple random sampling (4 LGAs per senatorial zone, covering urban metropolitan, semi-urban, and rural areas).
2. **Stage 2 (Facility Selection)**: Within the 12 LGAs, 24 KSCHMA-accredited facilities were selected based on service volume and facility type: 12 PHCs, 8 Secondary General Hospitals, and 4 accredited Private Clinics.
3. **Stage 3 (Participant Recruitment)**: Enrolled women aged 15–49 years who had delivered within the 12 months preceding the survey and were accessing post-natal care, infant immunisation, or routine child health services at the selected facilities were systematically sampled (N = 1080).

Statistical Analysis & Data Management

The data were collected electronically using **Kobo Toolbox/ODK Collect** on Android devices, with real-time field validation and GPS tracking.

The data were summarised as frequencies, and percentages, for socio-demographic characteristics, the number of antenatal care visits ($\geq$ 4 versus < 4), and place of delivery.

Inferential Analysis:

- **Bivariate analysis**: Chi-square tests were used to assess the associations between participants' characteristics and place of delivery.
- **Multivariable Logistic Regression**: A binary logistic regression model was used to identify independent determinants of facility-based delivery versus home delivery. Facility-based delivery included deliveries at PHCs, secondary healthcare facilities, and accredited private health facilities.
- **Effect estimates**: Associations were presented as odds ratios (ORs) with 95% confidence intervals (CIs). Statistical significance was set at $p < 0.05$

Ethics Approval and Consent to Participate

The Health Research Ethics Committee (HREC) of the Kano State Ministry of Health approved this study [NHREC/17/03/2018]. We secured administrative clearance from the KSCHMA and the managers of the participating health facilities. We combined all data extracted from the facility Health Management Information System logs and administrative claims databases and anonymised it before analysis. We obtained written informed consent from each participant. The study followed the Declaration of Helsinki.

Results

Table 1 describes the socio-demographic and obstetric characteristics of the 1,080 participants**.** Most were aged 30–49 years (60.7%)**,** and 58.8% were full-time housewives**.** Regarding education, 36.5% had informal education**,** while 27.2% each had primary and secondary education; only 9.1% had tertiary education. Most participants resided in rural areas (58.1%)**.** The majority **(**80.3%**)** did not report out-of-

pocket financing, while KSCHMA enrolment was almost evenly distributed between formal (49.8%) and informal (50.2%) categories. Nearly half of the participants were para 2–4 (45.6%)**,** while 27.2% each were primiparous or had parity ≥5. Late ANC booking (>14 weeks GA) was reported by 69.6% of participants, and most **(**67.8%**)** booked ANC at primary healthcare facilities.

>> Insert table 1>>

Figure 1 shows that home delivery was the predominant place of delivery, accounting for nearly three-quarters (73.0%) of all deliveries. This was followed by deliveries at primary health centres (12.8%), secondary health centres (9.6%), and private health facilities (4.6%).

>> Insert Figure 1>>

As shown in **Table 2,** home delivery was significantly more common among women with lower educational attainment, with 85.3% of those with informal education and all women with primary education delivering at home. In contrast, women with tertiary education had a substantially higher proportion of facility-based deliveries, particularly in private facilities (37.8%). Place of residence was also strongly associated with place of delivery, with home delivery being more common among rural women (85.5%) than urban women (39.3%). Conversely, urban women were more likely to deliver in PHCs (28.4%) or SHCs (25.7%). A significant but relatively modest association was observed between OOP payment and place of delivery. Women who reported OOP payment had a higher proportion of home deliveries (80.3%) than those who did not report OOP payment (71.2%). Place of delivery also varied significantly by parity. All primiparous women in the study delivered at home, while women with five or more previous births had higher proportions of deliveries in PHCs (28.2%) and SHCs (21.8%). ANC utilisation was strongly associated with place of delivery. Women with fewer than four ANC visits predominantly delivered at home (86.5%), compared with 53.7% among those with four or more visits, indicating greater use of facility-based delivery among women with more frequent ANC attendance. Similarly, women who booked ANC early (14 weeks' gestation) had a lower proportion of home deliveries (69.8%) than those who booked ANC late (>14 weeks), among whom 80.2% delivered at home. The facility where ANC was booked showed a particularly strong association with place of delivery. Women who booked ANC at PHCs were more likely to deliver at PHCs, while those who booked at SHCs were more likely to deliver at SHCs. Women who booked ANC at private facilities also had the highest proportion of private-facility deliveries (36.3%). In contrast, age ($p = 0.658$), occupation ($p = 0.143$), and KSCHMA type ($p = 0.728$) were not significantly associated with place of delivery.

>>Insert Table 2 >>

We used binary logistic regression to identify determinants of facility delivery. Educational level, place of residence, number of ANC visits, and timing of ANC booking were significantly associated with facility delivery. Compared with women with tertiary education, those with informal education had significantly lower odds of facility delivery (OR = 0.074, 95% CI: 0.008–0.701; p = 0.023). Rural residents also had significantly lower odds of facility delivery than urban residents (OR = 0.013, 95% CI: 0.001–0.108; p < 0.001). Women who had fewer than four ANC visits had lower odds of facility delivery compared with those who had four or more visits (OR = 0.103, 95% CI: 0.029–0.362; p < 0.001). Similarly, Late ANC booking (>14 weeks' gestation) was associated with lower odds of facility delivery compared with early ANC booking (≤14 weeks) (OR = 0.228, 95% CI: 0.066–0.791; p = 0.020). In contrast, OOP payment, parity, and the facility where ANC was booked were not significantly associated with facility delivery.

>>**Insert Table 3>>**

Discussion

Antenatal care and skilled attendance at birth are still essential aspects of maternal care for the purpose of reducing global maternal mortality. For many years, efforts have been undertaken to improve ANC and facility-based deliveries by introducing user fee policies. [10] The Kano State government has introduced free maternal healthcare services integrated into the KSCHMA vulnerable population health insurance scheme. This study offers a comprehensive assessment of KSCHMA and maternal healthcare utilisation in Northern Nigeria.

Our results show that the financial protection offered by KSCHMA encourages attendance at antenatal care, as (41.2%) of women had an adequate number of ANC visits. This figure is greater than the (17.3%) documented by Okediji *et al.* [9]. This difference may be due to the type of data used and the extent to which participants were exposed to user fees policies. In our case, we used primary data. In contrast, Okediji *et al.* used secondary data from the Nigerian Health and Demographic Survey (NDHS), and their study did not include any information on insurance or user fees policy. Likewise, Adewuyi et al. found that North-west Nigeria had the highest underutilisation of ANC, at (69.3%) [13]. The high level of utilisation in our study may also be attributed to the financial protection provided by KSCHMA, as (80.3%) of participants reported no OOP expenses for antenatal or delivery services. Removing user fees turns latent demand for healthcare into actual service utilisation, enabling pregnant women to enter the healthcare system

About 30% of the participants booked their first antenatal visit in the first trimester, while 69.6% booked it later. This finding is also seen in several studies in and outside Nigeria [14-16]. Nevertheless, our figure is lower than the 85.3% late ANC booking reported in Southwest Nigeria [14]. The ANC adequacy attendance/booking figures we report in this study are also considerably higher than the historical baseline coverage rates recorded in the NDHS for Kano State, highlighting the potential transformative impact of state-level health insurance schemes [2]. Late booking of antenatal care is common in most

sub-Saharan African countries because of financial and other structural obstacles. This situation shows the political will and commitment to improving maternal health in Kano State. It is therefore recommended that similar initiatives be carried out in other states in the region to counter the deterioration of maternal health indicators.

We reported informal sector participation for maternal health care through vulnerable population health insurance coverage to be slightly higher (50.2%) than formal sector participation (49.8%), and over 58.1% were rural dwellers. This suggests the KSCHMA scheme provided more coverage to the most vulnerable populations. However, skilled attendance at birth was low, as only 27.0% delivered in a health facility. This corroborates Mwaisaka *et al.* in Kenya, where they reported that (29.3%) delivered in health facilities among women who attended group ANC. [17] This similarity may be due to similar study designs and the fact that both studies were from Sub-Saharan Africa where structural and financial obstacles hindered maternal healthcare services utilisation.

The factors identified in this study for facility-based delivery were level of education (women with only informal education had lower odds of delivering in a facility than those with tertiary education), four or more ANC visits, and living in urban areas favours facility-based delivery. Similarly, Nayeem *et al.* found that women who delivered in a facility had a higher level of education and had four or more ANC visits. [18] These similar findings may indicate that higher education gives women the knowledge and autonomy needed to make decisions about their own health. Nevertheless, our study found that many women who attended antenatal care at the PHC delivered at a secondary or private facility. Those who booked antenatal care late were less likely to deliver at a facility; booking early enables early detection and is linked to better pregnancy outcomes. Based on our findings, we recommend a mixed-methods study to investigate and comprehend the determinants of ANC-delivery mismatch among KSCHMA enrollees.

Strengths and Limitations

A major strength of this study is the use of robust multivariable statistical modelling (specifically binary logistic regression). Limitations include the cross-sectional design, which prevents determining direct causality, and potential recall bias regarding OOP expenses incurred during labour.

Conclusions

In Northern Nigeria, the social health insurance scheme known as KSCHMA strongly promotes the use of maternal health care services, leading to higher rates of antenatal care and more births taking place in institutions. Nevertheless, gaps in the supply side infrastructure cause operational bottlenecks and as a result patients bypass Primary Health Care facilities for delivery. To achieve sustainable Universal Health Coverage, it is necessary to combine demand-side financial risk protection with focused investments in PHC readiness, continuous supply chains, and emergency referral facilities.

Abbreviations

ANC
Antenatal Care
KSCHMA
Kano State Contributory Healthcare Management Agency
LGA
Local Government Area
NHDS
Nigerian Health and Demographic Survey
OOPE
Out of Pocket Expenditure
PHC
Primary Healthcare
SHC
Secondary Healthcare
UHC
Universal Health Coverage

Declarations

Ethics Approval and Consent to Participate

The Health Research Ethics Committee of the Kano State Ministry of Health approved the study (Reference: NHREC/17/03/2018). Before data collection, we obtained written informed consent (or, for illiterate participants, thumbprint consent, witnessed by a third party).

Consent for Publication

Not applicable.

Availability of Data and Materials

The data sets that were used and/or examined in the current study can be obtained from the corresponding author upon reasonable request.

Competing Interests

The authors have nothing to declare that might be seen as a competing interest.

Funding

The authors declare that they received no external funding for this study. The lead author and KSCHMA funded the study.

Authors' Contributions

RAM, ZA was responsible for conceiving and designing the study.

AHY, ZA, and AOL collected data and built quantitative models.

Each author prepared, critically revised, and approved the manuscript.

Acknowledgements

The authors would like to express our thanks to the management and staff of the KSCHMA, the Kano State Ministry of Health, the facility administrators, and the women who took part in this study.

Tables

Table 1
General characteristics of the participants (n = 1080)

Variables	Frequency	Percentage
Age (years)		
15–29	424	39.3
30–49	656	60.7
Occupation		
Full-time housewife	635	58.8
Others	445	41.2
Educational level		
Informal	394	36.5
Primary	294	27.2
Secondary	294	27.2
Tertiary	98	9.1
Place of residence		
Rural	627	58.1
Semi-rural	196	18.1
Urban	257	23.8
Out-of-pocket financing		
No	867	80.3
Yes	213	19.7
KSCHMA type		
Formal	538	49.8
Informal	542	50.2
Parity		
Primipara	294	27.2
Para 2–4	492	45.6
Para ≥ 5	294	27.2
Number of ANC visits	294	27.2

Variables	Frequency	Percentage
< 4 visits	635	58.8
≥ 4visits	445	41.2
ANC booking		
Early (≤ 14 weeks GA)	328	30.4
Late (> 14 weeks GA)	752	69.6
Facility booked for ANC		
Primary healthcare	732	67.8
Secondary healthcare	246	22.8
Private healthcare	102	9.4

Table 2

Association between participants characteristics and place of delivery (n = 1080)

Variables	PHC	SHC	Private	Home	χ^2	P value
Age (years)					0.19	0.658
15–29	43(10.1%)	52(12.3%	22(5.2%	307(72.4%)		
30–49	95(14.5%	52(7.9%)	28(4.3%)	481(73.3%)		
Occupation					2.149	0.143
Full-time housewife	101(15.9%)	58(9.1%)	3(0.5%)	473(74.5%)		
Others	37(8.3%)	46(10.3%)	47(10.6%)	315(70.8%)		
Educational level					570.386	< 0.001
Informal	25(6.3%)	26(6.6%)	7(1.8%)	336(85.3%)		
Primary	0(0.0%)	0(0.0%)	0(0.0%)	294(100%)		
Secondary	83(28.2%)	64(21.8%)	6(2.0%)	141(48.0%)		
Tertiary	30(30.6%)	14(14.3%)	37(37.8%)	17(17.3%)		
Place of residence					229.180	< 0.001
Rural	33(5.3%)	28(4.5%)	30(4.8%)	536(85.5%)		
Semi-rural	32(16.3%)	10(5.1%)	3(1.5%)	151(77.0%)		
Urban	73(28.4%)	66(25.7%)	17(6.6%)	101(39.3%)		
Out-of-pocket					8.023	0.046
No	116(13.4%)	89(10.3%)	45(5.2%)	617(71.2%)		
Yes	22(10.3%)	15(7.0%)	5(2.3%)	171(80.3%)		
KSCHMA type					0.121	0.728
Formal	79(14.7%)	60(11.2%)	10(1.9%)	389(72.3%)		
Informal	59(10.9%)	44(8.1%)	40(7.4%)	399(73.6%)		
Parity					260.334	<0.001
Primipara	0(0.0%)	0(0.0%)	0(0.0%)	294(100%)		

Bold – significant, PHC – primary healthcare facility, SHC – secondary healthcare facility,

Private – private facility, Home – home unskilled delivery, KSCHMA – Kano state contributary health management agency.

Variables	PHC	SHC	Private	Home	χ^2	P value
Para 2–4	55(11.2%)	40(8.1%)	44(8.9%)	353(71.7%)		
Para ≥ 5	83(28.2%)	64(21.8%)	6(2.0%)	141(48.0%)		
Number of ANC visits					151.671	<0.001
< 4 visits	46(7.2%)	35(5.5%)	5(0.8%)	549(86.5%)		
≥ 4 visits	92(20.7%)	69(15.5%)	45(10.1%)	239(53.7%)		
ANC booking					12.856	0.005
Early (≤ 14 weeks GA)	30(9.1%)	22(6.7%)	13(4.0%)	263(69.8%)		
Late (> 14 weeks GA)	108(14.4%)	82(10.9%)	37(4.9%)	525(80.2%)		
Facility booked for ANC					311.631	< 0.001
PHC	129(17.6%)	68(9.3%)	6(0.8%)	529(72.3%)		
SHC	2(0.8%)	36(14.6%)	7(2.8%)	201(81.7%)		
Private	7(6.9%)	0(0.0%)	37(36.3%)	58(56.9%)		

Bold – significant, PHC – primary healthcare facility, SHC – secondary healthcare facility,

Private – private facility, Home – home unskilled delivery, KSCHMA – Kano state contributary health management agency.

Table 3
Determinants of facility delivery

Variable	OR (95% CI)	P-value
Educational level		
Informal	0.074(0.008–0.701)	0.023
Primary	1.129(0.001–1.607)	0.980
Secondary	0.087(0.007–1.179)	0.066
Tertiary	1	
Place of residence		
Rural	0.013(0.001–0.108)	< 0.001
Semi-rural	3.986(0.764–20.784)	0.101
Urban	1	
Out-of-pocket		
No	1.702(0.497–5.829)	0.379
Yes	1	
Parity		
Primipara	0.844(0.195–3.653)	0.82
Para 2–4	0.751(0.332–1.697)	0.49
Para ≥ 5	1	
Number of ANC visits		
< 4 visits	0.103(0.029–0.362)	< 0.001
≥ 4visits	1	
ANC booking		
Early (≤ 14 weeks GA)	1	
Late (> 14 weeks GA)	0.228(0.066–0.791)	0.020
Facility booked for ANC		
PHC	2.072(0.236–18.173)	0.511
SHC	0.070(0.004–1.160)	0.063

Bold – significant, PHC – primary healthcare facility, SHC – secondary healthcare facility, Private – private facility, 95% confidence interval (CI), OR = Odds ratio. 1 = reference category.

Variable	OR (95% CI)	P-value
Private	1	

Bold – significant, PHC – primary healthcare facility, SHC – secondary healthcare facility, Private – private facility, 95% confidence interval (CI), OR = Odds ratio. 1 = reference category.

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Figures

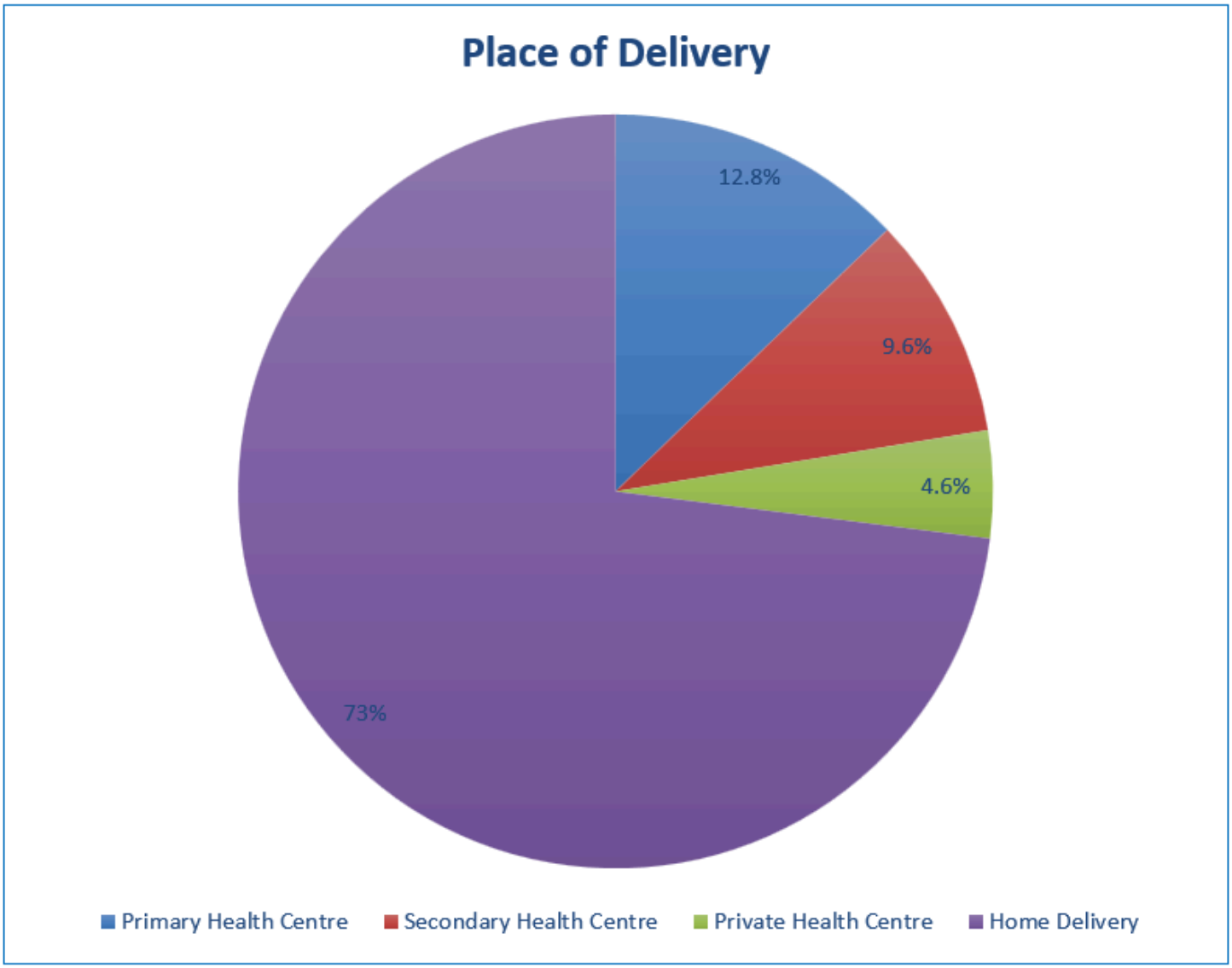


Figure 1

Showing the places of delivery of the participants (n = 1080)

Supplementary Files

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- ANCquestionnaire.docx