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Prevalence and factors associated with caesarean section among Tanzanian women of reproductive age: evidence from the 2022 Tanzania demographic and health survey data

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Abstract

Background Caesarean Section (CS) is one of the commonest surgical procedures worldwide. It is an important medical intervention for reducing the risk of poor perinatal outcomes. However, there was increased trends in CS in sub-Saharan Africa as maternal and neonatal mortality and morbidity remains high. This study aims to determine the prevalence and factors associated with CS rates in Tanzania.

Methodology This was a secondary data analysis of 4,768 women of reproductive age (15–49) in Tanzania. The data utilized was from the Tanzania Demographic Health and Survey (TDHS) 2022. The factors associated with CS were identified using multivariable binary logistic regression.

Results Out of 4,768 women of reproductive age in Tanzania, 497 (10.4%) had CS. Attaining primary (Adjusted Odds Ratio (aOR): 1.79,95% CI 1.23–2.60), secondary (aOR:2.07,95% CI 1.36–3.14) and higher education (aOR: 2.35, 95% CI 1.08–5.12); having a husband/partner with higher education; being in richest household wealth quintile (aOR:1.98,95% CI (1.31-3.00), having a job (aOR:1.29, 95% CI: 1.05–1.58 and having attended more than 4 antenatal care (ANC) visits (aOR: 1.36, 95% CI: 1.11–1.67) were associated with a higher odds of undergoing CS compared to their respective counterparts. However, living in rural areas (aOR: 0.74, 95% CI:0.58–0.94), being multiparous women with 2–4 births (aOR: 0.67, 95% CI: 0.53–0.84) and 5 or more births (aOR: 0.44, 95% CI: 0.32–0.60) were associated with lower odds of CS.

Conclusion The overall prevalence of CS among women of reproductive age in Tanzania was 10.4%. The highest educational level, husband/partner's educational attainment, household wealth quintile, type of residence, employment status, increased ANC number, and high parity were associated with CS. The CS prevalence is at the lower limit of the recommendation of the World Health Organisation of 10–15%. Further researches are necessary to highlight other barriers, facilitators and outcome of CSs in Tanzania to advise policy stakeholders.

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Keywords CS, Women, Reproductive age, Tanzania

Background

As opposed to traditional vaginal delivery, cesarean section (CS) has been on an increasing trend globally at a rate of 4.4% annually with notable increases in Eastern Europe and Asia [1]. Cesarean deliveries (CS) are projected to rise to 28.5% globally by 2030 [2]. According to a study conducted by Igwemadu et al., about 25% of all deliveries in many countries were by CS [3]. CS is often preferred over vaginal delivery due to the perception of it being painless and safer [4]. It is a medical intervention that is invaluable in saving the life of mothers and babies before or during labour in selected cases [5]. However, the World Health Organization (WHO) has set an acceptable limit of 15% for CS deliveries [6, 7]in order to mitigate health risks associated with the procedure such as postoperative infections complications causing morbidity and mortality [8].

The adoption rate of CS in Africa was slow, with West and Central Africa being the last to adopt the process with 3% in 2000 to 4.1% in 2015 [9]. In Burkina Faso, CS was as low as 2%. In order to encourage more women who needed to carry out the procedure, a no cost policy was established back in 2016 [10]. An evidence of growth in adoption of cesarean section in a study conducted in Rwanda stated that the rate of cesarean section increased from 2.2% in 2000 to 15.6% in 2019/20 [11]. However, unnecessary utilization of the cesarean section procedure has adverse health effects on the mother, the child, or both [12, 13]. Currently, cesarean section in Sub-Saharan Africa is rising at an alarming rate and unfortunately, 1 out of every 100 women dies after cesarean Sect. [14]. Despite this, the benefits of the procedure cannot be overemphasized.

The indications for CS includes previous Cesarean Section, fetal distress, prolonged labor, failed induction, and malpresentation/ malposition [15]. Other associated factors includes poor socioeconomic status, lower density of obstetricians, and lower density of hospital beds [16]. Furthermore, regional, cultural preferences, social norms, the pregnant women's attitudes toward cesarean section and obstetricians' beliefs or attitudes toward cesarean section can impact on the prevalence of CS in a region [17]. Another study identified factors affecting cesarean section rates to include; bad experience of previous vaginal delivery, a lack of information about the adverse outcomes after a cesarean section, child bad delivery position, mothers' underlying medical condition, reduction in perinatal mortality and neonatal morbidity, twin pregnancy, fear of vaginal delivery and misconceptions about the superiority [18].

Fetal presentation, and uterine dynamics, at the time of admission, were evidently associated with cesarean Sect. [19]. Complication such as dystocia, foetal distress, breach births, post-term pregnancy, multiple pregnancy, and pregnancy-induced hypertension are other reasons why cesarean section is favoured over vaginal delivery [20]. Region of residence, type of place of residence, couples' level of education, wealth index, year of birth, previous terminated pregnancy, use of contraception, size of child, mother's age at first birth, preceding birth interval and Hepatitis B vaccination or infection, Human immunodeficiency virus infection also influences cesarean delivery rates [21].

In Tanzania, the CS deliveries rates was 28.9% in a tertiary hospital with 29,752 singleton deliveries [22]. In Tanzania, the percentage of women having cesarean sections increased from 2% in 1996 to 6% in 2015–16. The same study showed that women in urban regions continued to have a greater rate of CSs than women in rural areas, and this difference grew with time [23]. There are paucity of studies on the current prevalence and factors influencing CS rates in Tanzania. Therefore, this study aims to determine the prevalence and factors associated with CS in Tanzanian women of reproductive age using the latest Demographic and Health survey data.

Methods

Study sampling and participants

Data from the 2022 Tanzania Demographic and Health Survey (DHS) were utilized for this secondary data analysis. From February to July 2022, a population-based cross-sectional study was conducted in Tanzania using a stratified two-stage cluster sampling method. DHS are cross-sectional, nationally representative surveys of households, with women of reproductive age (15–49 years) self-reporting on the use of reproductive and maternal healthcare.

A total of 15,705 households were successfully interviewed. In the interviewed households, 15,699 women aged 15–49 who were either permanent residents of the selected households or visitors who stayed in the household the night before the survey were interviewed. However, interviews were completed with 15,254 women. Women who underwent CS in the 5 years before the survey were included in the analysis.

Outcome variable

The outcome variable was delivery by CS, which was categorized into "Yes" or "No". Women who underwent CS were coded as 1 and their counterpart who didn't were coded as 0.

Explanatory variables

Previous research on cesarean sections served as the basis for the selection of the independent factors [11, 24, 25]. Socio-demographic factors and other characteristics were included in the following explanatory variables. Age was recoded into three age groups (15–19,20–34,35–49) and marital status with two response options (married, living with partner). About highest educational level for our respondents and husband/partner level, four levels were considered (no education, primary, secondary, and higher education). We have also household wealth quintile (poorest, poorer, middle, richer, and richest), type of residence (rural, urban) and employment status (not working, working). Number of Antenatal care (ANC) visits was grouped into two categories (< 4, ≥ 4) and parity was grouped into three (1,2–4, ≥ 5).

Data analysis

Analysis was done using SPSS version 25 statistical software (IBM SPSS Statistics). Frequencies and percentages were computed to describe the demographic characteristics of respondents and outcome variable.

Table 1 Socio-demographic and reproductive characteristics of the study participants

Variables		Frequency *N* = 4,768	Percentage
Age	15–19	295	6.2
	20–34	3302	69.3
	35–49	1171	24.6
Marital status	Married	3439	72.1
	Living with partner	1329	27.9
Highest educational level	No education	995	20.9
	Primary	2449	51.4
	Secondary	1273	26.7
	Higher	51	1.1
Husband/partner's education level	No education	666	14.0
	Primary	2676	56.1
	Secondary	1208	25.3
	Higher	147	3.1
	Don't know	71	1.5
Household wealth quintile	Poorest	1010	21.2
	Poorer	938	19.7
	Middle	940	19.7
	Richer	961	20.2
	Richest	919	19.3
Type of residence	Urban	1278	26.8
	Rural	3490	73.2
Working status	Not working	1938	40.6
	Working	2830	59.4
Number of ANC	< 4	2775	58.2
	≥ 4	1993	41.8
Parity	1	871	18.3
	2–4	2489	52.2
	≥ 5	1408	29.5

Binary and multivariable logistic regression analyses were performed to examine the existence of a relationship between CS and the independent variables. Bivariate analysis was conducted for all the independent variables against the outcome variable determining their odds ratio (OR) and P-value. All independent variables that were statistically significant at P-value < 0.05 in the bivariate analysis were entered for multivariable binary logistic regression analysis. The crude odds ratios (COR) and adjusted odds ratios (aOR) with their accompanying 95% confidence intervals (32).

Variables that had a *P*-value < 0.05 at multivariable analysis were considered as significant factors associated with caesarean among reproductive age women (15–49 years). The results were presented in the form of text and tables. The goodness of fit of the final model was tested by Hosmer-Lemeshow p-value > 0.05.

Results

A total of 4,768 participants were included in this study (Table 1). The majority were 20–34 years old (69.3%), married (72.1%), living in rural area and working (59.4%). Additionally, 51.4% attained a primary level of education, 58.2% had attended less than 4 ANC and 52.2% parity of 2–4 children. Moreover, 56.1% had Husband/partner's with primary education and 21.2% were in the poorest category.

The overall prevalence of CS was 10.4% among women of reproductive age in Tanzania.

A bivariate analysis in Table 2. Indicates that highest educational level, husband/partner's education level, household wealth quintile, type of residence, employment status, number of ANC and parity were associated with CS.

The factors associated with CS are shown in Table 3. Women with primary (aOR: 1.79,95% CI 1.23–2.60), secondary (aOR: 2.07,95% CI 1.36–3.14) and higher education (aOR: 2.35, 95% CI 1.08–5.12) had higher odds of CS compared to the women without education. Women whose husband/partner attained higher education had 87% higher odds of CS compared to the women whose husband/partner had no education.

In terms of economic factors, women in richer household wealth quintile (aOR:1.98,95% CI (1.31-3.00) and those in middle (aOR:1.91,95% CI (1.28–2.85) had 1.9 times higher odds of CS compared to the women in the poorest household wealth quintile. Moreover, women in the richest category have a 2.8 greater odds of having a CS than the women in the poorest household wealth quintile. Odds of CS were 26% lower for women living in rural area compared to the women living in urban area (aOR: 0.74, 95% CI:0.58–0.94). Moreover, women who were working (aOR:1.29, 95% CI: 1.05–1.58) had 29% higher odds of CS than those who had no job.

Table 2 Association between socio-demographic and reproductive characteristics and caesarean section

Variables		OR [95% CI]	CS		P-Value
			No (%)	Yes (%)	
Age	15–19	1.00	264(89.5)	31(10.5)	1.00
	20–34	0.95[0.65–1.40]	2970(89.9)	332(10.1)	0.804
	35–49	1.10[0.73–1.66]	1037(88.6)	134(11.4)	0.65
Marital status	Married	1.00	3081(89.6)	358(10.4)	1.00
	Living with partner	1.01[0.82–1.24]	1190(89.5)	139(10.5)	0.96
Highest educational level	No education	1.00	957(96.2)	38(3.8)	1.00
	Primary	2.56[1.80–3.64]	2223(90.8)	226(9.2)	< 0.001
	Secondary	5.12[3.59–7.30]	1058(83.1)	215(16.9)	< 0.001
	Higher	13.74[7.10-26.56]	33(64.7)	18(35.3)	< 0.001
Husband/partner's education level	No education	1.00	631(94.7)	35(5.3)	1.00
	Primary	1.65[1.14–2.38]	2452(91.6)	224(8.4)	0.008
	Secondary	3.18[2.18–4.62]	1027(85.0)	181(15.0)	< 0.001
	Higher	9.01[5.56–14.61]	98(66.7)	49(33.3)	< 0.001
	Don't know	2.29[1.02–5.15]	63(88.7)	8(11.3)	0.045
Household wealth quintile	Poorest	1.00	969(95.9)	41(4.1)	1.00
	Poorer	1.56[1.03–2.35]	880(93.8)	58(6.2)	0.034
	Middle	2.41[1.64–3.53]	853(90.7)	87(9.3)	< 0.001
	Richer	3.15[2.18–4.56]	848(88.2)	113(11.8)	< 0.001
	Richest	6.49[4.57–9.21]	721(78.5)	198(21.5)	< 0.001
Type of residence	Urban	1.00	1048(82.0)	230(18.0)	1.00
	Rural	0.38[0.31–0.46]	3223(92.3)	267(7.7)	< 0.001
Employment	Not working	1.00	1759(90.8)	179(9.2)	1.00
	Working	1.24[1.03–1.51]	2512(88.8)	318(11.2)	0.027
Number of ANC	< 4	1.00	2564(92.4)	211(7.6)	1.00
	≥ 4	2.04[1.69–2.46]	1707(85.6)	286(14.4)	< 0.001
Parity	1	1.00	724(83.1)	147(16.9)	1.00
	2–4	0.61[0.49–0.76]	2214(89.0)	275(11.0)	< 0.001
	≥ 5	0.28[0.21–0.37]	1333(94.7)	75(5.3)	< 0.001

Additionally, women who attended more than 4 ANC had 36% higher chance of CS compared to their counterparts who attended fewer than 4 ANC (aOR: 1.36, 95% CI: 1.11–1.67).

About parity, multiparous women with 2–4 births (aOR: 0.67, 95% CI: 0.53–0.84),5 and more (aOR: 0.44, 95% CI: 0.32–0.60) had respectively 33% and 56% lesser odds of CS compared to primiparous. However, the age and marital status were not associated with CS.

Discussion

Our research revealed that the nationwide prevalence of CS in Tanzania is 10.4%, which may indicate a low level of service utilization of CS in the nation. Almost similar CS prevalence (11.4%) was reported in a study conducted in Ghana [26]. The CS rate in Tanzania is at the lower border of the WHO recommendation of CS rates of 10–15% [27]. This may suggest either that some women that will benefit from the procedure are not being offered or there are not enough health personnel or facilities for the procedure in Tanzania. This is a strong possibility considering the fact that CS rates is as high as 30% in high resource settings such as the United States of America [28].

Table 3 Multivariate logistic regression of the factors associated with caesarean section in Tanzania

Variables		AOR	*P*-Value	95% CI
Highest educational level	No education	1.00	1.00	1.00
	Primary	1.79	**0.002**	[1.23–2.60]
	Secondary	2.07	**0.001**	[1.36–3.14]
	Higher	2.35	**0.032**	[1.08–5.12]
Husband/partner's education level	No education	1.00	1.00	1.00
	Primary	0.91	0.647	[0.61–1.35]
	Secondary	0.94	0.785	[0.61–1.46]
	Higher	1.87	**0.035**	[1.04–3.35]
	Don't know	0.87	0.757	[0.37–2.04]
Household wealth quintile	Poorest	1.00	1.00	1.00
	Poorer	1.4	0.116	[0.92–2.12]
	Middle	1.91	**0.002**	[1.28–2.85]
	Richer	1.98	**0.001**	[1.31-3.00]
	Richest	2.82	**< 0.001**	[1.79–4.42]
Type of residence	Urban	1.00	1.00	1.00
	Rural	0.74	**0.015**	[0.58–0.94]
Employment	Not working	1.00	1.00	1.00
	Working	1.29	**0.015**	[1.05–1.58]
Number of ANC visits	< 4	1.00	1.00	1.00
	≥ 4	1.36	**0.003**	[1.11–1.67]
Parity	1	1.00	1.00	1.00
	2–4	0.67	**0.001**	[0.53–0.84]
	≥ 5	0.44	**< 0.001**	[0.32–0.60]

The higher the level of educational attainment among women, the more likely they are to opt for a CS. Our findings were in line with a study conducted in Nigeria which revealed that CS in prevalence was comparatively higher in women who had acquired at least a secondary level of education (4.8%), and in rich households (4.5%). This can be explained by limited access to antenatal care and a lack of knowledge about childbirth options. Nevertheless, women with secondary or higher education had a lower risk of CS delivery, according to a study done in northern Ghana with a smaller sample size [29].

Our findings indicated that women in richer household wealth quintile (aOR:1.98,95% CI (1.31-3.00) and those in middle (aOR:1.91,95% CI (1.28–2.85) had 1.9 times higher odds of CS compared to the women in the poorest household wealth quintile. These findings align with a study conducted by Islam et al. in Sub-Saharan Africa, which reported that more women with formal education and from higher socioeconomic classes had CSs as

compared to women from lower socioeconomic classes [25]. Similar results were found in Ghana, where the CS rate increased in tandem with women's increasing wealth level [30]. This may be due to the fact that people with a higher standard of living often have easier access to quality antenatal care. This can make it possible to detect and manage possible complications of pregnancy more effectively, and to have recourse to a CS if necessary.

We found that Odds of CS were 26% lower for women living in rural areas compared to the women living in urban areas (aOR: 0.74, 95% CI:0.58–0.94). Similar results were found in a study conducted in Nigeria, where women living in urban residence had higher odds of CS than those living in rural areas [24].Other studies indicated that people from urban environments are more likely to use C-section deliveries, while people from rural locations use them less frequently [25, 26]. Cesarean sections are performed in hospitals, and there are few hospitals in rural areas. Referral fees and transportation to the hospitals where the C-section is performed could also be factors in the underutilization for women living in rural environments.

In our study, women who attended more than 4 ANC had 36% higher chance of CS compared to their counterparts who attended fewer than 4 ANC (aOR: 1.36, 95% CI: 1.11–1.67). A study performed in Brazil showed that increased prenatal visits and cesarean sections were found to be statistically significantly correlated [31].

Multiparous women with 2–4 births (aOR: 0.67, 95% CI: 0.53–0.84), 5 and more (aOR: 0.44, 95% CI: 0.32–0.60) had respectively 33% and 56% lesser odds of CS compared to primiparous. This is consistent with the results of a study in Nigeria, primiparous women had an increased proportion and yet at more risk of CS delivery compared to multiparous [32]. It was also in line with a retrospective cohort study (2000–2015) conducted in Tanzania, primiparous women were more likely to give birth by CS [32]. That can be explained that oftentimes, first-time mothers have smaller pelvic dimensions, which can complicate the baby's passage down the birth canal.

Strength and limitations

The use of DHS dataset, which used a validated questionnaire of DHS MEASURE, was the strength of the study. It is also a national wide representative survey. However, the use of a cross sectional study design that cannot describe cause and effect relationship of variables was the limitation of the study.

Conclusion

Our study discovered that the prevalence of cesarean section was 10.4% in Tanzania. There was a strong association found between CS and the following factors: highest educational level, husband/partner's education level, household wealth quintile, type of residence, employment status, number of ANC and parity. The CS prevalence of Tanzania is at the lower limit of the recommendation of the World Health Organization of 10–15%. This may suggest that some women that needed the procedure were not offered or did not have access to it, thereby leading to increased perinatal morbidity and mortality. Further researches are necessary to highlight other barriers, facilitators and outcome of CSs in Tanzania to advise policy stakeholders.

Abbreviations

ANC	Antenatal care
aOR	Adjusted odd ratio
CI	Confidential Interval
CS	Cesarean section
OR	Odd ratio

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Author contributions

BN conceptualized and designed the study, analyzed the data, interpreted the findings, and wrote the manuscript. SN, GB and CN provided guidance on concept development, data analysis, and final manuscript development. The final manuscript was read and approved by all authors.

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Data availability

Data are available upon request from the Demographic and Health Surveys portal: https://www.dhsprogram.com/data/dataset_admin/login_main.cfm

Declarations

Ethical approval

This study utilized secondary data, and ethical considerations did not require specific approval. However, the authorization to access and use the datasets was granted by the DHS program management.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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