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THE POTENTIAL IMPACT OF SOCIOECONOMIC STATUS ON MATERNAL HEALTH, TAMIL NADU, INDIA: A PROSPECTIVE OBSERVATIONAL STUDY.

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Abstract

Objectives
This study aims to analyze the health challenges experienced by antenatal women and assess the influence of socioeconomic factors, with the goal of informing targeted interventions to enhance global maternal health outcomes.

Methods
This prospective observational study, conducted at Sree Balaji Medical College and Hospital's (SBMCH) Obstetrics and Gynaecology Department over 18 months, enrolled 326 pregnant women without pre-existing conditions. The study focused on the impact of socioeconomic status on diverse pregnancy complications, using randomization as the sampling technique. Comprehensive assessments, including history, examinations, and various blood investigations, were performed, followed by a meticulous follow-up throughout pregnancy.

Results
The study identified a predominant age group of 20-34 years among pregnant women, with notable BMI variations. Notably, 61.3% exhibited a normal BMI, 11.7% experienced spontaneous abortion, with 57.9% occurring in the lower socioeconomic class, and 7.4% manifested congenital anomalies, with 83.3% from the lower socioeconomic class. Furthermore, prevalent conditions like anemia (54.3%), GDM (21.8%), cervicovaginal infections (24.8%), and hypertensive disorders (35.9%) showcased substantial associations with socioeconomic factors.

Conclusion
The findings of the present investigation underscore the crucial role of socioeconomic factors in maternal health outcomes, emphasizing the need for targeted interventions and awareness programs. This study provides valuable insights for future public health initiatives aiming to address and alleviate health disparities among pregnant women.

Recommendation
The study recommends implementing targeted interventions and educational initiatives to address socioeconomic disparities, thereby enhancing maternal health outcomes.

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Introduction
Maternal health, a linchpin in the broader landscape of public health, demands a nuanced exploration of the intricate interplay between socioeconomic status (SES) and its multifaceted dimensions. SES, encapsulating both social and economic facets, emerges as a critical determinant of an individual's position in society, with education and income standing out as pivotal indicators reflecting both knowledge and material resources [1-4].

In the realm of adult health outcomes, extensive research has probed the impact of socioeconomic indicators, but the pregnancy period emerges as a pivotal stage where these factors wield substantial influence [5, 6]. The vulnerabilities during pregnancy are heightened by adverse socioeconomic circumstances, contributing to a spectrum of complications that significantly elevate maternal morbidity and mortality rates [5].

In the global context of health initiatives like the Millennium Development Goals, maternal health takes center stage with targets aimed at reducing mortality and ensuring universal access to reproductive health [6]. Achieving these goals necessitates a comprehensive understanding of socioeconomic status, incorporating essential elements such as access to sufficient diets, basic literacy, health services, and safe water and sanitation facilities during antenatal and postnatal periods. These

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elements hold the transformative potential to mitigate up to 90% of complications linked to pregnancy and childbirth, especially in developing regions [7].

This research paper aims to explore the health challenges faced by antenatal women, focusing on complications such as hypertensive disorders, hemorrhages, infections, anemia, preterm labor, and gestational diabetes mellitus. The primary focus is on evaluating how socioeconomic status influences the occurrence and severity of these maternal health problems.

Materials and Methods

Study design

A prospective observational study

Study setting

The study was conducted in the Obstetrics and Gynaecology Department of Sree Balaji Medical College and Hospital (SBMCH), Chennai, Tamil Nadu, India for a period of one and a half years. The research included pregnant women without any pre-existing conditions who visited the SBMCH outpatient department. The study took place from August 2017 to February 2019.

Participants

The research focuses on pregnant women attending SBMCH OPD without comorbidities. The study, spanning one and a half years, aimed to include approximately 400 pregnant women. Randomization was employed as the sampling technique.

Inclusion and exclusion criteria

The study included pregnant women who met specific conditions such as initiating their first antenatal visit before 12 weeks of gestational age, having no prior history of medical disorders, and carrying a singleton pregnancy. Participants were required to commit to regular antenatal visits at the hospital's OPD. On the other hand, individuals with a multiple pregnancy or those with either current or historical medical disorders were not considered for the study.

Study size

The study included 326 pregnant women who met specific inclusion criteria.

Parameters Studied

The investigation centers on assessing the impact of socioeconomic status on diverse adverse pregnancy complications, including abortions, congenital anomalies, anemia, gestational diabetes mellitus, lower genital tract infections, urinary tract infections, hypertensive disorders of pregnancy, antepartum hemorrhage, preterm premature rupture of membranes (PPROM), and pre-labor rupture of membranes (PROM).

Study Procedure

Detailed histories were obtained from pregnant women in the OPD and those admitted after obtaining informed consent. Inclusion and exclusion criteria were defined. Using Kuppuswamy classification, the study population was stratified into five socioeconomic groups based on indicators like education, occupation, and family income per month.

Following comprehensive history and examinations, including general and per abdomen examinations, blood pressure and pulse rate checks, and dating ultrasonography, various blood investigations were conducted, such as complete blood count, blood grouping and typing, serology (HIV, HbSag, VDRL), bleeding time and clotting time, fasting blood sugar and OGCT, and Free T3, T4, and TSH.

Patients were followed throughout pregnancy, and their health was evaluated based on socioeconomic status. The development of complications was observed. BMI was calculated using pre-pregnancy and pre-delivery weight and height, assessing weight gain during pregnancy using the formula: weight in kilograms divided by the square of the height in meters (kg/m^2). The prevalence of complications and their relation to socioeconomic status was categorized. A comparative analysis was conducted among various classes based on different pregnancy complications and their impact on maternal health.

Bias

Selection bias may occur as the study exclusively enrols pregnant women without comorbidities from a specific medical facility, potentially excluding a more diverse representation of the population. Additionally, information bias could arise from relying on self-reported data and potential variability in healthcare access among different socioeconomic groups. Awareness of these potential biases is essential for interpreting and applying the study's results accurately.

Ethical consideration

This study upholds ethical standards by obtaining informed consent, ensuring privacy, and securing approval from the Institutional Human Ethics Committee to protect participants' rights and maintain transparency (Ref. No. 002/SBMC/IHEC/2017/948).

Statistical Analysis

The data analysis employed IBM SPSS Statistics software version 23.0. Descriptive statistics, including frequency and percentage analysis for categorical variables and mean with standard deviation for continuous variables, were utilized to characterize the data. Significance in categorical data was determined using the Chi-Square test, with a significance level set at .05.

Results/Outcomes

Participants

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The study revealed a predominant age group of 20-34 years among pregnant women, featuring diverse BMI classifications and parity statuses. Notably, 61.3% were categorized with a normal BMI, 19.9% as underweight, 13.8% as overweight, and 2.5% each as having obesity type 1 and type 2. The socioeconomic classification, based on education, occupation, and family income, showcased a substantial representation from the upper-lower socioeconomic class.

Remarkably, complications such as spontaneous abortion and congenital anomalies demonstrated statistically significant associations with lower socioeconomic classes. Specifically, 11.7% of pregnancies resulted in spontaneous abortion. The highest numbers of abortion were seen in the lower socioeconomic class with 57.9% of these cases. The second highest were seen in lower middle, followed by the upper middle classes. Additionally, 7.4% of pregnancies exhibited congenital anomalies. However, in these cases also, the highest numbers were seen in the lower socioeconomic class with a notable 83.3%. The second highest were seen in lower middle, followed by the upper middle classes (Table 1).

Table 1: Distribution of abortion and congenital anomalies with socio-economic classes

Socioeconomic status			Abortion		Total	Congenital anomalies		Total
			Yes	No		Yes	No	
SES	Upper	Count	0	10	10	0	10	10
		%	0.0%	3.5%	3.1%	0.0%	3.3%	3.1%
	Upper Middle	Count	2	24	26	1	25	26
		%	5.3%	8.3%	8.0%	4.2%	8.3%	8.0%
	Lower Middle	Count	6	48	54	2	52	54
		%	15.8%	16.7%	16.6%	8.3%	17.2%	16.6%
	Upper Lower	Count	8	197	205	1	204	205
		%	21.1%	68.4%	62.9%	4.2%	67.5%	62.9%
	Lower	Count	22	9	31	20	11	31
		%	57.9%	3.1%	9.5%	83.3%	3.6%	9.5%
Total		Count	38	288	326	24	302	326
		%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Moreover, prevalent conditions like anemia (54.3%), gestational diabetes mellitus (GDM) (21.8%), cervicovaginal infections (24.8%), urinary tract infections (23.6%), hypertensive disorders in pregnancy (35.9%), antepartum hemorrhage (5.8%), and preterm premature rupture of membranes (PPROM) (6.1%) displayed robust correlations with socioeconomic factors (Table 2).

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Table 2: Prevalence of health conditions in the study cohort

Condition	Frequency (out of 326)	Percent (%)
Anemia	177	54.3
Gestational Diabetes Mellitus	71	21.8
Infection of lower genital tract	81	24.8
Urinary tract infection	77	23.6
Hypertensive disorders	117	35.9
Antepartum hemorrhage	19	5.8
Preterm premature rupture of membranes	20	6.1
Prelabour rupture of membranes	13	4.0

Among the women diagnosed with various health conditions, it was further observed that most of the patients belonged to the upper lower or lower middle-class families. Health conditions, such as anemia (73.4%), lower genital tract infection (54.3%), urinary tract infections (72.7%), and hypertensive disorders (47.9%) were found in large proportion in the upper lower-class families. In contrast, this class showed lower counts of gestational diabetes mellitus cases which was seen in larger numbers in the mothers belonging to the lower middle class families (Table 3).

Table 3: Socioeconomic class vs prevalence of maternal health conditions in the study cohort

Maternal disease	Socioeconomic class				
	Upper	Upper middle	Lower middle	Upper lower	Lower
Anaemia	1 (0.6 %)	3 (1.7 %)	12 (6.8%)	130 (73.4 %)	31 (17.5 %)
Gestational diabetes mellitus	4 (5.6 %)	18 (25.4 %)	24 (33.8 %)	13 (18.3 %)	12 (16.9 %)
Lower genital tract infection	0 (0 %)	0 (0 %)	13 (16.0 %)	44 (54.3 %)	24 (29.6 %)
Urinary tract infection	0 (0 %)	2 (2.6 %)	4 (5.2 %)	56 (72.7 %)	15 (19.5 %)
Hypertensive disorders	0 (0 %)	3 (2.6 %)	40 (34.2 %)	56 (47.9 %)	18 (15.4 %)
Antepartum haemorrhage	0 (0 %)	2 (10.5 %)	3 (15.8 %)	4 (21.1 %)	10 (52.6 %)

Table 4: The different socioeconomic factors of the participants and their specific conditions

Socioeconomic Class	% with Abortion	% with Congenital Anomalies	% with Anemia	% with GDM	% with Lower Genital Tract Infection	% with Hypertensive Disorders
Upper	0.0%	0.0%	0.6%	5.6%	0%	0%
Upper Middle	5.3%	4.2%	1.7%	25.4%	0%	2.6%
Lower Middle	15.8%	8.3%	6.8%	33.8%	16.0%	34.2%
Upper Lower	21.1%	4.2%	73.4%	18.3%	54.3%	47.9%
Lower	57.9%	83.3%	17.5%	16.9%	29.6%	15.4%

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Evidently, the study underscores the profound impact of socioeconomic status on maternal health outcomes, offering a comprehensive perspective with numerical insights into the intricate relationships between various pregnancy complications and the socioeconomic background of pregnant women.

Discussion

Conducted at SBMCH Chennai, India, this study involving 326 pregnant women provided valuable insights into the relationship between pregnancy complications and socioeconomic status. The majority of the study population belonged to the upper-lower socioeconomic class, highlighting the diverse backgrounds represented in the research.

Examining the educational distribution, the study found that 64.7% of participants had completed education up to high school, revealing a contrast with the findings of Gopalakrishnan et al.'s study [8]. The occupational breakdown demonstrated that 52.5% of the participants were engaged in semi-skilled work.

The research delved into various pregnancy complications, including spontaneous abortion, congenital anomalies, anemia, gestational diabetes mellitus (GDM), hypertensive disorders, cervicovaginal infections, antepartum hemorrhage, preterm premature rupture of membranes (PPROM), prelabour rupture of membranes (PROM), and urinary tract infections. The results unveiled significant associations between socioeconomic status and pregnancy complications. While GDM strongly correlated with high socioeconomic status, spontaneous abortion and congenital anomalies were notably linked with low socioeconomic status. The prevalence of anemia was particularly pronounced in the upper-lower socioeconomic class.

Among all the variables examined, only gestational diabetes mellitus (GDM) exhibited a robust association with high socioeconomic status. The study reveals a significant correlation between socioeconomic status and abortion incidence, with abortion rates being highest (64%) in the upper-lower socioeconomic class (Class 4) and lowest (0.9%) in the upper socioeconomic class, demonstrating statistical significance with a P-value of 0.0005.

Likewise, Dickson et al. reported that 25% of females with a primary education level had a history of abortion, with 73% belonging to economically disadvantaged families [9]. Norsker et al. found a similar trend, indicating a 1.15 times increased risk of abortions in low-income families [10]. Moreover, several other studies have also demonstrated results consistent with our findings between educational level and the risk of spontaneous abortion [11,12].

The elevated incidence of non-chromosomal congenital anomalies in individuals with low socioeconomic status, as highlighted by Vrijheid et al. [13] and supported by Rosano et al. [14], underscores a critical health disparity. Mariela et al. [15] and Bailey et al. [16] further endorse this correlation, emphasizing the broader implications of socioeconomic factors on prenatal outcomes.

The study delved into anemia in pregnancy, revealing a significant association with socioeconomic class. The prevalence of 54.3%, concentrated in the upper-lower (Class 4) socioeconomic class (73.4%), highlights a concerning trend. These align with Sharif et al.'s findings which shows the highest anemia rates among those with no formal education and the lowest among those with tertiary education [17].

Lokare et al.'s observations of a majority of anemic pregnant women originating from low socioeconomic classes, supported by Morsy and Alhady, collectively strengthen the evidence for an inverse relationship between anemia prevalence and socioeconomic status [18, 19]. This global pattern is further emphasized by the disproportionate prevalence of anemia in developing countries, particularly Southeast Asia, compared to developed countries [18, 19].

Transitioning to hypertensive disorders, the study corroborates previous research, revealing a significant association with socioeconomic status [19-21]. Similarly, urinary tract infections displayed a notable correlation, particularly within the upper-lower socioeconomic class. The investigation also identified significant associations between low socioeconomic status and complications such as antepartum hemorrhage, preterm premature rupture of membranes (PPROM), and premature rupture of membranes (PROM).

The ensuing discussion underscores the intricate relationships discovered, emphasizing the necessity for targeted interventions to address disparities and improve maternal health outcomes.

Generalizability

While the study provides valuable insights into the socioeconomic impact on maternal health in the specific context of SBMCH Chennai, its generalizability to diverse geographical and cultural settings may be limited. Future research across varied regions and populations is essential to validate and extend the findings.

Conclusion

Addressing socioeconomic disparities in maternal health is crucial in India. The study reveals higher risks of antenatal complications among the economically disadvantaged, emphasizing the need for targeted interventions. To combat this, comprehensive awareness programs on health practices and government initiatives are essential, particularly in rural and slum areas. Education plays a pivotal role in reducing maternal health problems, emphasizing the importance of accessible and well-executed health policies.

Limitations

The limitations of the study include potential recall bias due to reliance on self-reported data and the study's limited generalizability beyond the specific geographic context of SBMCH Chennai. Additionally, external factors influencing fluctuations in socioeconomic status were not fully accounted for, possibly impacting the study's accuracy.

Recommendations

The study recommends the implementation of targeted educational campaigns to raise awareness among pregnant women, emphasizing the importance of regular antenatal visits, proper dietary habits, and access to healthcare services. Furthermore, there is a need for comprehensive policy measures to address socioeconomic disparities and enhance maternal healthcare in vulnerable populations.

Acknowledgement

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List of Abbreviations

SES - Socioeconomic Status
OPD – Out Patient Department
SBMCH - Sree Balaji Medical College and Hospital
PPROM - Preterm Premature Rupture of Membranes
PROM - Pre-Labor Rupture of Membranes
BMI – Body Mass Index

Source of funding

No source of funding.

Conflict of interest

No conflict of interest.

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