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Original Research Article

Financial burden of antenatal care services: a study in Hassan district, Karnataka

Dhasharatha K. T.*, Mahesha M.

Department of Economics and Cooperation, University of Mysore, Mysuru, Karnataka, India

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***Correspondence:**
Dhasharatha K. T.,
E-mail: dmaharaja36@gmail.com

ABSTRACT

Background: Antenatal care (ANC) is backbone of the maternal healthcare; yet, the financial burden for receiving these services is a key barrier in less developed and developing countries, including India. Despite schemes by governments to give free maternal and child health care, out-of-pocket expenditure remains considerable financial burden for households, particularly within financially weaker population. This study analyses the financial burden of ANC services in Hassan district, by comparing the total direct, indirect and total costs of ANC services among public, private and mixed healthcare centres.
Methods: For this purpose, a cross-sectional study was conducted among 415 antenatal women who had engaged ANC services in Hassan district. Data were collected on socio-demographic elements, healthcare centres usage patterns and total cost components including total direct and indirect cost. One-way ANVOA tests was applied to evaluate cost divergence throughout healthcare centres types, accompanied by Dunn's post-Hoc pairwise comparisons with Bonferroni correction.
Results: The results of ANOVA indicated there is a significant difference in all three costs of ANC services for three types users. Catastrophic health expenditure occurred in 51.6% of public healthcare centres users, followed by 51.5% of mixed and 43.3% of private healthcare centres users.
Conclusions: According to this study we found that, catastrophic health expenditure is still a significant issue in this study area. Therefore, policy measures required to emphasise on upgrade of public healthcare centres infrastructure, and the control of private healthcare centres pricing.

Keywords: Antenatal care, Catastrophic health expenditure, Mixed healthcare centres, Public healthcare centres, Private healthcare centres

INTRODUCTION

Antenatal care (ANC) check-ups during pregnancy refer to routine medical examinations conducted by healthcare professionals for pregnant women throughout the antenatal period. It helps in monitoring the health and wellbeing of antenatal women and supports the developing natal. Routine ANC check-ups enable health personnel to detect possible risks early, offer necessary interventions, and provide treatment and important health education to ensure a safe pregnancy and delivery. ANC check-ups improve healthy habits, prepare pregnant women for natal birth, with improved overall newborn outcomes. Increasing the frequency of antenatal care check-ups may lead to a reduction in maternal and infant mortality.[1]

The sustainable development goals (SDGs), particularly Target 3.1, maintain this commitment by aiming to reduce the global maternal mortality ratio to below 70 per 100,000 live births by 2030.[2] The National Health Policy 2017 aimed to reduce the IMR to 28 for 1000 live births by 2019 and further to 25 by 2025.[3] Under the National Health Mission, revised targets aim to reduce the IMR to 23 per 1000 live births by 2025.[4]

The World Health Organisation recommends a minimum of 8 ANC visits during pregnancy to enhance maternal and foetal health, including routine health examination, nutritional supplementation, screening for complications, and health education.[1]

In this direction, India has made remarkable progress in reducing maternal and infant mortality rates during the last 3 decades. The Maternal Mortality Ratio (MMR) declined from 556 per 100,000 live births in 1990 to 88 in 2021-23, decline of 86%.[5,6] Similar to the IMR declined from 80 per 1000 live birth in 1990s to 25 in 2023, indicating a 71% reduction at the national level.[7,6]

This enhancement has been stimulated by flagship programmes such as the National Health Mission (NHM), Janani Suraksha Yojana (JSY), and Janani Shishu Suraksha Karyakram (JSSK), which collectively aim to incentivise institutional deliveries, provide free maternal healthcare services in public facilities and reduce financial barriers to care-seeking behaviour.[8] Dispute contesting these investigations, out-of-packet expenditure (OOPE) on maternity care has continuously increased, particularly within the private healthcare sector, where expenses have escalated disproportionately relative to household income levels.[9,10]

Catastrophic Health Expenditure (CHE) on maternal care from public health centres significantly decreased from 56% to 29% after the implementation of the National Health Mission, while the decline in private institutions was slightly smaller, dropping from 56% to 47%.[8] A study conducted in Mangaluru, Karnataka, revealed that 100% of the surveyed women had enrolled for ANC, although only 26.6% utilized available government schemes, while 16% of families faced catastrophic expenditure.[11]

The economic implications of such expenditure are particularly significant during pregnancy, as households identify simultaneous demand on financial resources due to laboratory charges, ultrasound charges, medical cost, transportation and nutrition foods.

In this broader viewpoint, the Hassan district, characterised by mixed healthcare delivery system, offered an optimal setting for analysing the divergent costs of ANC services across public and private healthcare centres. The majority of studies has concentrated on delivery care, with limited attention given to antenatal care and few studies have analysed the mixed utilization of public and private health facilities among pregnant women. Examination of catastrophic health expenditure at the healthcare centres-type level has rarely been included in studies of antenatal care costs. This study fills existing those gaps by providing a thorough comparative analysis of ANC costs in Hassan district, hence giving empirical information to guide local policy formulation.

METHODS

Study design and setting

This cross-sectional descriptive study was conducted in Hassan district, Karnataka, India, from December 2023 to December 2024. Hassan district has eight taluks and is served by one district hospital (medical college), 7 sub divisional hospitals, 7 first referral units, numerous PHCs and CHCs in the public sector, and over 50 ayurvedic hospitals, clinic, nursing homes, super speciality and multi-speciality hospitals providing obstetric services.

Study population and sampling

The study population comprised pregnant women had availed ANC services during the study period. The study respondents were selected from both rural (n = 275) and urban (n=140) areas using proportionate stratified random sampling. The proportion of pregnant women registered in the e-Janma software during 2022 served as the basis for determining the numbers of respondents to be selected from each area. Participants were selected through simple random sampling method. Respondents were categorized based on their healthcare centres utilisation into three groups: public healthcare centres (n=155), private healthcare centres (n=97), and mixed healthcare centres (n=163).

Data collection

Data were gathered via face-to-face interviews along with a structured, pre-tested interview schedule. It completed pre-testing with 25 respondents (excluded from the final study) and was subsequently enhanced following their feedback. The study obtained data on socio-demographic variables, ANC services components, type of healthcare centres and complete cost information.

Cost information was classified into two main categories: a) Total direct costs, covering consultation fees, laboratory charges, ultrasound charges, pharmacy expenses and inpatient charges; and b) Total indirect costs, covering supplementary nutrition spending during pregnancy, traveling charges for ANC visits, and other miscellaneous costs. All cost were recorded in Indian rupees (₹).

Expenditure data was verified with prescriptions, bills, and healthcare centres receipts maintained by the participants whenever feasible. In the missing of documentary evidence, estimations based on recall-based were recorded using proper appropriate prompts to reduce recall bias.

Statistical analysis

Descriptive statistics were utilised to identify the socio-demographic profile and cost distribution across healthcare centres types, with results expressed as mean,

and frequencies with percentages for categorical variables. A parametric (one-way ANOVA) test was used for assessing the cost across healthcare centres types. Dunn's post-Hoc pairwise comparisons with Bonferroni correction were used to unequal group sizes and to control type I error. Welch's Robust test was conducted to identify significant differences across healthcare centres types and effect size were measured using η^2 (Eta-squared). Catastrophic health expenditure was identified when ANC services costs exceeding 10% of annual household income. Data were analysed using python 3.11 version.

RESULTS

Socio-demographic variables of respondents

Table 1 indicates the socio-demographic variables of the 415 respondents categorised by healthcare centres types. The majority of respondents from rural areas, the proportion of rural respondents was much higher among public healthcare centres users (73.5%) and mixed healthcare centres users (72.4%), compared to private healthcare centres users (44.3%). The mean age of respondents utilising public healthcare centres is 25.4 years, while those using private healthcare centres are little older at 27.9 years. School education was the most common education qualification among public healthcare centres users (89.2%), while college education was most common education qualification among private healthcare centres users (75.3%). A significant majority of public healthcare centres users (96.1%) had annual family incomes of within ₹5,00,000, whereas a relatively larger proportion of private healthcare centres users had incomes exceeding ₹ 10 lakhs. The Other Backward Classes (OBC) caste was common throughout the entire sample.

Table 1: Socio-demographic variables of respondents by healthcare centres (n=415).

Variables	Public healthcare centres (n=155), N (%)	Private healthcare centres (n=97), N (%)	Mixed healthcare centres (n=163), N (%)
Location			
Rural	114 (73.5)	43 (44.3)	118 (72.4)
Urban	41 (26.5)	54 (55.7)	45 (27.6)
Age (years)			
Mean age (years)	25.4 years	27.9 years	26.9 years
Education			
School education	125 (89.2)	24 (24.7)	81 (49.7)
College education	30 (19.4)	73 (75.3)	82 (50.3)
Annual family income			
Below ₹5,00,000	149 (96.1)	38 (39.2)	112 (68.7)
₹500001-10,00,000	4 (2.6)	34 (35.1)	42 (25.8)
Above ₹10,00,001	2 (1.3)	25 (25.8)	9 (5.5)
Caste			
SC	50 (32.3)	6 (6.2)	25 (15.3)
ST	7 (4.5)	2 (2.1)	7 (4.3)
OBC	98 (63.2)	89 (91.8)	131 (80.4)

Descriptive statistics of ANC components

Table 2 demonstrates the descriptive statistics of ANC components of the 415 respondents categorised by healthcare centres types. The mean number of ANC visits was highest for mixed healthcare centres users (13.15), followed by private healthcare centres users (11.77), and lowest for public healthcare centres users (9.86). According to the WHO 2016 guidelines, pregnant women should have a minimum of 8 ANC visits, in this study, users of all types of healthcare centres obtained an average ANC higher than the WHO recommendation.

The mixed healthcare centres group users again had highest average of lab tests (5.22), while private healthcare centres-only users recorded the lowest (4.04). Public healthcare centres users exhibited the lowest average using ultrasound (3.90), whereas private healthcare and mixed healthcare centres users demonstrated higher averages (4.31 and 4.43 respectively).

TT vaccination is uniformly approaches 2 doses across healthcare centres types, while folic acid 0.5 mg and ferrous sulphate100mg + folic acid 0.5 mg and calcium tablets were similarly received across all healthcare centres groups, demonstrate standardised immunisation compliance irrespective of healthcare centres type.

Table 2: Descriptive statistics of ANC component of respondents by healthcare centres types.

ANC Component	Public healthcare centres (n=155), Mean, %	Private healthcare centres (n=97), Mean, %	Mixed healthcare centres (n=163) Mean, %	Overall (n = 415) Mean
Number of ANC visits	9.86	11.77	13.15	11.6
Number of lab tests	4.86	4.04	5.22	4.81
Number of Ultrasound	3.90	4.31	4.43	4.2
Number of TT received	1.97	1.98	1.99	1.98
Number of Folic Acid 0.5mg (1-12weeks) and IFA (after 12 weeks) (Ferrous sulphate 100mg + Folic Acid 0.5 mg) tablets received	211.32	211.19	219.94	214.67
Number of calcium tablets (1000 mg) received	185	192.63	194.91	190.67

Table 3: Component wise comparison of total direct costs of ANC services expenditure – Mean with ANOVA.

Component	Public healthcare centres, Mean (n=155)	Private healthcare centres, Mean (n=97)	Mixed healthcare centres, Mean (n=163)	F value	P value
Consultation fees	₹17	₹3,031	₹2,049	205.28	< 0.001
Laboratory charges	₹55	₹5,449	₹3,767	53.46	< 0.001
Ultrasound charges	₹5,108	₹7,459	₹6,635	11.50	< 0.001
Pharmacy expenses	₹3,130	₹8,627	₹6,927	25.05	< 0.001
Inpatient charges	₹0	₹31	₹31	0.87	0.419
Total direct cost	₹8,310	₹24,596	₹19,409	74.223	< 0.001

Comparison of average total direct costs of ANC services

Table 3 reports segmented total direct cost components for ANC service. Public healthcare centres charged a nominal mean consultation fee of ₹17, while private healthcare centres imposed an average consultation fee of ₹3,031 and mixed healthcare centres charged of ₹2,049. Consultation fees most significant difference among healthcare centres users ($F=205.28$, $p<0.001$) which is below 1% of conventional level. Laboratory charges exhibited a similar structure, with private healthcare centres charging ₹5,449 compared to a negligible ₹55 in public healthcare centres ($F=53.46$, $p<0.001$).

Ultrasound charges in public healthcare centres averaging ₹5,108, mixed healthcare centres ₹6,635 and private healthcare centres ₹7,459. The ultrasound charges highly statistically difference across healthcare centres users ($F=11.50$, $p<0.001$). Pharmacy expenses revealed significant variance ($F=25.05$, $p<0.001$), with users of private healthcare centres outlay a mean cost of ₹8,627 compared to ₹3,130 for users of public healthcare centres. Inpatient charges across all types of healthcare centres did not significantly differ ($F=0.87$, $p=0.419$). The mean total direct cost is highest for pregnant women using private healthcare centres for ANC services (₹24,596), followed by users of mixed healthcare centres (₹19,409) and public healthcare centres (₹8,310). The ANOVA analysis revealed a very highly significant result in total direct cost of ANC services among 3 types of healthcare centres users ($F=74.223$, $p<0.001$), indicating that the difference is statistically significant within the 1% conventional level.

Comparison of average total indirect costs of ANC services

Table 4 indicate that classified total indirect cost components for ANC service. The cost of supplementary nutrition during pregnancy includes iron, calcium, protein, omega-3, magnesium, vitamin C and D, folate and fiber-rich foods. Supplementary nutrition cost significantly influences total indirect cost across all healthcare centres, with cost ranging from ₹18,029 in public healthcare centres users to ₹28,328 in private healthcare centres users. This difference is statistically significant as shown by ANOVA ($F=17.34$, $p<0.001$) which is less than 1% of conventional level. Transportation charges also significantly differ among healthcare centres types, with users of private healthcare centres incurring a mean expenditure of ₹3,307, in compared to ₹2,222 for public healthcare centres users. In this study the one-way ANOVA revealed a significant difference (($F=17.34$, $p<0.001$) for transportation charges of ANC services throughout healthcare centres categories. This results likely shows the longer distances that users of private healthcare centres travel to access preferred healthcare facilities. The miscellaneous costs across all

healthcare centres types did not significantly differ (F=1.56, p>0.05).

The average total indirect cost is highest for users of private healthcare centres (₹31,672), followed by users of mixed healthcare centres (₹24,687), and users of public healthcare centres (₹20,251). This difference is very highly statistically significant as shown by ANOVA (F=19.73, p<0.001) which is less than 1% of conventional level.

Table 4: Component wise comparison of total indirect costs of ANC services expenditure-Mean with ANOVA.

Component	Public healthcare centres, Mean (n=155)	Private healthcare centres, Mean (n=97)	Mixed healthcare centres, Mean (n=163)	F value	P value
Supplementary nutrition	₹18,029	₹28,328	₹21,306	17.34	< 0.001
Transportation charges	₹2,222	₹3,307	₹3,242	6.63	< 0.001
Miscellaneous costs	₹0	₹37±259	₹139	1.56	0.212
Total indirect cost	₹20,251	₹31,672	₹24,687	19.73	< 0.001

Table 5: Comparison of mean total costs with ANOVA and cost composition of ANC services across healthcare centres categories.

Parameter	Public healthcare centres, Mean (n=155)	Private healthcare centres, Mean (n=97)	Mixed healthcare centres, Mean (n=163)	F value	P value
Average total cost	₹28,562	₹56,268	₹44,096	61.775	<0.001
Total direct cost, %	29.1	43.7	44		
Total indirect cost, %	70.9	56.3	56		

Comparison of average total costs and cost composition

Table 5 exhibits the average total antenatal care (ANC) expenditure together with their compositional breakdown. The mean total ANC cost is highest for beneficiaries of private healthcare centres (₹56,268), followed by compared to mixed healthcare centres (₹44,096) and lastly, beneficiaries of public medical centres (₹28,562). In our study outcomes of one-way ANOVA (F=61.775, p<0.001) confirmed a very highly statistically significant differences for total cost of ANC services across three healthcare centres users. The analysis of cost composition indicated that total indirect costs represented the predominant part of total expenditure among healthcare providers: 56% in mixed healthcare centres, 56.3% in private healthcare centres, and 70.9% in public healthcare centres. The total direct cost accounted for, 44%, 43.7% and 29.1% in mixed healthcare centres, private healthcare centres, and public healthcare centres, respectively.

Post-hoc pairwise comparisons

Table 6 displays the comprehensive outcome of Dunn's post-hoc pairwise comparisons for all cost variables. Comparisons between public healthcare centres and private healthcare centres, as well as between public healthcare centres and mixed healthcare centres, indicated very highly statistically significant difference (Bonferroni adjusted p<0.001) in total direct cost, total indirect cost and total cost for ANC services. This trend indicates that cost burdens differ among users of public versus private healthcare centres and public verses mixed healthcare centres, possibly due to heterogeneous in consultation fees, ultrasound charges, laboratory charges, pharmacy charges, supplementary nutrition and transportation charges.

The comparisons between private healthcare centres and mixed healthcare centres indicated highly statistically significance difference (Bonferroni adjusted p<0.01) in total direct cost and total cost. Total indirect cost showed no significant difference between private and mixed healthcare centres (Bonferroni adjusted p<0.091), indicating that both groups demonstrate similarly in supplementary nutrition expenses and transportation charges behaviours.

Welch's robust test and effect size interpretation

Table 7 illustrates interpretations of robustness and effect size. The Welch's test, which does not require the assumption of equal variance, corroborated with the ANOVA outcomes by generating significantly larger test statistics. Welch's ANOVA demonstrated a very highly significant disparity among the three healthcare centres regarding total direct cost, total indirect cost and total cost (Welch statistic=156.436, p<0.001; Welch statistic= 28.900, p<0.001 and Welch statistic =104.972, p<0.001, respectively) for ANC services, therefore reinforcing the consistency of outcomes.

Healthcare utilisation centres accounted for 26.5% of the variance in the total direct cost (η^2=0.265, large effect), 8.7% observed in total indirect costs (η^2=0.087, medium effect), and 23.1% observed in total cost for ANC services. The pronounced influence of total direct costs

compared to total indirect costs statistically demonstrates that healthcare centres utilise a significantly larger impact on clinical expenses than on non-clinical expenses, which are determined by comprehensive socio-economic factors.

Table 6: Dunn's post-Hoc pairwise comparisons with Bonferroni correction.

Variable	Comparison	z-stat	P value	Adj.p	Significance
Total direct cost	Public versus Private healthcare centres	-12.203	< 0.001	< 0.001	***
	Public versus Mixed healthcare centres	-10.597	< 0.001	< 0.001	***
	Private versus Mixed healthcare centres	3.049	0.002	0.007	**
Total indirect cost	Public versus Private healthcare centres	-5.357	< 0.001	< 0.001	***
	Public versus Mixed healthcare centres	-3.704	< 0.001	< 0.001	***
	Private versus Mixed healthcare centres	2.168	0.030	0.091	NS
Total cost	Public versus Private healthcare centres	-10.087	< 0.001	< 0.001	***
	Public versus Mixed healthcare centres	-8.113	< 0.001	< 0.001	***
	Private versus Mixed healthcare centres	3.085	0.002	0.006	**

Bonferroni-adjusted p values (×3); NS = Not Significant; *p<0.05; ** p < 0.01; ***p<0.001

Table 7: Welch's Robust test and effect size interpretation.

Variable	F- Statistic	Welch statistic	η^2 (Eta-squared)	Effect
Total direct cost	74.223***	156.436***	0.265	Large
Total indirect cost	19.733***	28.900***	0.087	Medium
Total cost	61.775***	104.972***	0.231	Large

***p<.001, η^2 interpretation following Cohen (1988): Small (0.01-0.06), Medium (0.06-0.14), Large (>0.14)

Financial burden relative to household income due to ANC services

Table 8 exhibit the financial burden analysis of the ANC services expenditure relative to household income. Despite absolute ANC services expenses were lower in public healthcare centres users spent an average of 14.5% of their annual household income on ANC services, compared to 11% for private healthcare centres users and 13.3% for mixed healthcare centres users. This appear paradox is illustrated by the very diverse income profiles; the average annual income was highest for private healthcare centres users (₹8,58,536), followed by mixed healthcare centres users (₹4,82,184), and lowest for public healthcare centres users (₹2,66,422).

In this study catastrophic health expenditure impacted 51.6% of public healthcare centres users, 43.3% of private users, and 51.5% of mixed users, despite the lower direct costs for individuals receiving ANC services at public healthcare centres, the financial burden is greater because to higher indirect costs, and lower income among the pregnant women utilising these services.

Table 8: Financial burden of ANC services expenditure relative to household income.

Indicator	Public healthcare centres (n=155)	Private healthcare centres (n=97)	Mixed healthcare centres (n=163)	P value
Mean annual income	₹2,66,422	₹8,58,536	₹4,82,184	<0.001
ANC cost as % of annual income, %	14.5	11	13.3	
Catastrophic expenses (>10% of annual income), %	80/155 (51.6)	42/97 (43.3)	84/163 (51.5)	

Catastrophic expenses defined as ANC services cost >10% of annual household income

DISCUSSION

This study reveals significant disparities in the frequency of antenatal care visits across different types of healthcare centres, with users of mixed healthcare centres having the highest average visits (13.1), followed by private (11.8) and public healthcare centre users (9.9). This pattern demonstrates dual utilisation; as pregnant women simultaneously engage both public and private healthcare providers to obtain double verification of their pregnancy-related health medical conditions, and when public healthcare centres doctors are unavailable for Out-Patient Department (OPD) services, they visit at private healthcare centres and respondents utilising private healthcare centres simultaneously access public healthcare centres to obtain free services, including blood tests, ultrasound, medicines, and Tetanus Toxoid (TT) injections. These research outcomes are similar to the study conducted by Devaraj et al, and Shetty et al.[12,13]

In our study the financial consequences are significant: the average total direct costs at private healthcare centres (₹24,596.4) and mixed healthcare centres (₹19,408.5) were 2.95-fold and 2.33-fold higher, respectively, rather

than public healthcare centres (₹8,310.4), while the average total expenses at private healthcare centres (₹56,268.2) and mixed healthcare centres (₹44,095.7) were 1.97 and 1.54 times higher against those public healthcare centres (₹28,561.9). A similar spending pattern was noted among antenatal women utilising both public and private healthcare services.[14]

This study examines the significant deficiencies in public healthcare centres delivery. In public healthcare centres, ultrasound charges (61.5%) and pharmacy expenses (37.7%) are the predominant direct expenditures. Under JSSK, only one ultrasound is offered at free of cost; however, users from public healthcare centres in this study received an average of four ultrasounds, necessitating dependence on private scanning centres and pharmacies. This dependency on external private providers significantly increases direct expenses for women who are believed receiving free public services. Similar findings were also reported by Prasanth et al, from Mangaluru, Banke-Thomas et al, in low- and middle-income countries.[11,15]

The varying impact of healthcare centre type on cost components is further clarified by effect size analysis. The large effect sizes for total direct cost (η^2=0.265) and total cost (η^2=0.231), suggest that facility type accounts for a considerable portion of variance in expenditure. The medium effect size for total indirect cost (η^2=0.087) indicates a relatively modest impact, aligning with the concept that indirect costs. These findings correspond with the results documented by Kim et al and Borghi et al.[16,17]

The negligible disparity in total indirect costs between private (₹31,671.8; 1.56-fold) and mixed (₹24,687.2; 1.21-fold) healthcare centres users compared to public healthcare centres users (₹20,251.4), was confirmed by Dunn's post-hoc test. This observation is partially corroborated by Govil et al, who categorised ANC users into public, private, and mixed groups in Rajasthan and noted intermediate out-of-pocket expenses among mixed healthcare users, although without including indirect costs.[18] To our knowledge, no previous research in India has specifically compared total indirect costs of ANC among public, private, and mixed healthcare centres utilisation types, providing this is a novel contribution to the literature on maternal healthcare financing.

The presents study also reveal that Catastrophic Health Expenditure (CHE) impacted 51.6% of public, 43.3% of private, and 51.5% of mixed healthcare centres users corresponds to national estimates by Bonu et al, and Goli et al, which indicated that approximately 51% of Indian households experienced catastrophic maternal expenditures.[10,19] The reduced prevalence of CHE among private healthcare centres users in our study contrasts with findings of Bora et al, and Mohanty & Kastor, likely due to the higher household income and payment capacity of private healthcare centres users, which diminishes their susceptibility to financial CHE facing higher absolute costs.[20,8] Moreover, the nearly identical CHE rates among public and mixed healthcare centres users (51.6% vs. 51.5%) indicate that simultaneous use of both groups does not offer enhanced financial protection, highlighting the necessity for significant cost-containment techniques in all healthcare centre settings.

The unequal sample sizes among healthcare centres groups (public 155, private 97, and mixed 163) illustrate that diversity of healthcare centres utilisation patterns rather than a deliberate allocation. This was the limitations of this study.

CONCLUSION

This study reveals statistically significant and clinically relevant disparities in total direct cost, total indirect cost, and total ANC costs across public, private, and mixed healthcare centres categories in Hassan district, Karnataka. Post-hoc analyses (Dunn's test), supported by large effect sizes (η^2 = 0.265 for direct costs, 0.231 for total costs), provides strong proof for accepting the research hypothesis of significant inter-group cost disparities.

The total expenses for private ANC are almost double those of government ANC, mostly due to consultation fees, laboratory charges, pharmacy expenses and supplementary nutrition. Indirect expenses, especially supplementary nutrition, predominate the total cost framework across all healthcare centres categories.

Recommendations

The paradox of increased proportional financial burden and Catastrophic Health Expenditure (CHE) among public healthcare centres users despite lower absolute costs highlights that while cost reduction through government intervention is essential, it is insufficient without additional financial protection mechanisms for financially weaker section. Antenatal Care (ANC) is backbone to maternal healthcare; therefore of, to reduce the financial burden associated with getting ANC services, the government may implement the following steps to reduce the economic burden for pregnant women: 1) A dedicated lab and scanning centre for the Obstetrics and Gynaecology (OBG) department at public healthcare centres, 2) Maintaining a continuous supply of all types of medications relevant to related to pregnant women in public healthcare centres, 3) Implementing a pricing control act to prevent excessive financial burdens on consumers of private healthcare centres.

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