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Prevalence, Regional Disparities, and Multilevel Determinants of Adequate Caregiving Practices among Children Under Five in Ethiopia: Evidence from the 2024–25 Ethiopian Demographic and Health Survey

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Abstract

Background

Nurturing care during early childhood shapes individuals' lifelong health, learning, and productivity. However, the individual-, household-, and community-level determinants of adequate caregiving practices among Ethiopian children have not been adequately examined. This study therefore assessed the national prevalence, regional variation, and determinants of adequate caregiving practices among children under five years of age in Ethiopia.

Methods

This was a cross-sectional study of 6,274 children under five years of age from the 2024–25 EDHS. Adequate caregiving practice was constructed from care-seeking for illness, safe stool disposal, breastfeeding, vaccination status, and living arrangement with the biological mother, with children meeting at least 75% of applicable indicators classified as having adequate caregiving. A four-level multilevel logistic regression model, incorporating sampling weights and clustering, was used to identify individual-, household-, and community-level determinants, reported as adjusted odds ratios with 95% confidence intervals.

Results

The national prevalence of adequate caregiving practices was 77.3% (95% CI: 74.9–79.5%), ranging from 55.8% in Afar to 86.5% in Central Ethiopia, and was higher in urban areas (80.8%) than in rural areas (75.9%). The null model showed an intraclass correlation coefficient of 22.9%, which remained substantial (25.2%) in the final model. Older child age (AOR range 1.76–2.54) and health insurance coverage (AOR = 1.52, 95% CI: 1.04–2.23) were significant individual-level predictors. Current maternal smoking (AOR = 0.35, 95% CI: 0.15–0.80), large household size (AOR = 0.50), having five under-five children (AOR = 0.06), and older household headship were associated with lower odds of adequate caregiving. Residing in Afar, Somali, or Dire Dawa was associated with significantly lower odds of adequate caregiving relative to Tigray.

Conclusion

Although a greater proportion of Ethiopian children receive adequate caregiving, substantial regional and community-level disparities persist. Priority child caregiving should be given to younger infants, children in large households, and pastoralist and historically underserved regions, alongside continued expansion of health insurance and community health infrastructure to close these gaps.

Introduction

Early childhood is the most sensitive period of human development, during which the quality of care a child receives shapes brain architecture; physical growth; and lifelong health, learning, and productivity [1]. The World Health Organization (WHO), the United Nations Children's Fund (UNICEF), and the World Bank Group jointly articulated this in the Nurturing Care Framework. In this framework, five interrelated and mutually reinforcing components have been identified such that every young child needs to survive and thrive. These components include good health, adequate nutrition, responsive caregiving, opportunities for early learning, and safety and security, all of which depend on caregivers who are themselves supported by an enabling household and community environment [2, 3]. The framework for early childhood development estimates that over 200 million children under five years of age in low- and middle-income countries (LMICs) fail to reach their developmental potential because of deficits in nurturing care rather than survival alone [4].

Caregiving practices refer to the set of behaviours through which parents and other caregivers meet a young child's needs, including supervision, protection, responsive interaction, stimulation, hygiene, and appropriate care seeking during illness. "Adequate" caregiving, in this sense, is not a single behaviour but a composite of practices that, together, keep a child safe, engaged, and developmentally supported. Subsequent work has reaffirmed that the principles of nurturing care extend beyond infancy and remain central to building human capital from the preconception period through adolescence, underscoring caregiving as a lifelong determinant of wellbeing rather than a narrow infant-feeding or health-seeking issue [5]. Evidence from multi-country surveys further shows that stimulation-related caregiving practices, such as engaging children in play and early learning activities, vary markedly by household resources and maternal education across LMICs, whereas unsupervised care of young children by other minors remains common in many low-income settings and is itself a marker of caregiving strain [6, 7].

A national study conducted through the nurturing care framework in Ethiopia revealed that, across urban, rural, pastoralist, internally displaced, and refugee settings, parenting practices frequently fall short of what children need for healthy growth and development, which is closely associated with poor caregiving responsiveness and safety concerns within the same household [8]. A complementary qualitative assessment carried out by UNICEF-Ethiopia similarly noted substantial gaps in parental knowledge, attitudes, and practices related to responsive caregiving, early stimulation, and early learning among caregivers of children from birth to six years [9]. An ethnographic study conducted in neighbouring Malawi reported that poor caregiving practices are associated with chronic poverty, food insecurity, climate and economic shocks, and limited access to quality health, nutrition, and early childhood development services [10]. This demonstrates how structural constraints, rather than caregiver knowledge alone, often drive caregiving gaps in the region.

The DHS-based multilevel studies conducted across sub-Saharan Africa identified maternal education, household wealth, maternal age, birth order, parity, marital status, exposure to mass media, antenatal care attendance, and place of delivery as recurrent individual- and household-level correlates of maternal

and childcare behaviours [11–14]. In Ethiopia specifically, multilevel analyses of EDHS 2016 data revealed that maternal age, body mass index, and antenatal care follow-up were significant predictors of non-breastfeeding, with mothers who received no antenatal care being more likely not to breastfeed than those with regular follow-up [15]. Similarly, multilevel modelling of delivery care service utilization via EDHS 2016 data revealed that maternal and partner education, urban residence, household wealth, and mass media exposure were strong predictors of protective caregiving [16]. Similarly, a multilevel analysis of exclusive and optimal breastfeeding among Ethiopian infants revealed that child age, household wealth, mode of delivery, and region were significant individual- and community-level predictors, with significant variation attributable to differences between communities [17].

A multilevel analysis of mothers' healthcare-seeking behaviour for children with symptoms of acute respiratory infection in Ethiopia revealed that clusters accounted for more than half (55%) of the total variability in treatment-seeking behaviour, with child age, maternal education, media exposure, household headship, and institutional delivery independently predicting whether caregivers sought care [18]. Similarly, evidence on community-based health insurance (CBHI) in Ethiopia shows that compared with unenrolled households, enrolled households are substantially more likely to seek healthcare for their sick children [19]. These findings support the same methodological conclusion that caregiving practices in Ethiopia cannot be adequately explained by individual and household characteristics alone and that models that fail to account for community-level clustering are likely to yield biased and imprecise estimates.

Despite the accumulation of qualitative and small-sample evidence in Ethiopia, no nationally representative, multilevel, quantitative study has examined the combined individual-, household-, and community-level predictors of multidimensional adequate caregiving practices in Ethiopia. Existing Ethiopian DHS-based multilevel studies have focused on single, narrowly defined outcomes, such as breastfeeding, delivery care, or care-seeking for a specific illness, leaving open questions about whether these established determinants hold for a broader, multidimensional caregiving construct. Understanding regional and contextual variations is particularly important in Ethiopia given the substantial differences in socioeconomic development, healthcare infrastructure, and access to health information among regions.

This study therefore used newly available 2024–25 EDHS data and a multilevel modelling framework to assess the national prevalence, regional variation, and individual-, household-, and community-level determinants of adequate caregiving practices among children under five years of age in Ethiopia.

Materials and methods

Study Design, Setting, and Data Source

We employed a cross-sectional study design via secondary data analysis of the 2024–25 Ethiopian Demographic and Health Survey (EDHS). Field work was conducted from August 2024 to April 2025 by

the Ethiopian Statistical Service in collaboration with the Ministry of Health and the Ethiopian Public Health Institute, with data processing completed in mid-2025 [20]. The survey covered all administrative regions of Ethiopia, including both urban and rural settings, allowing assessment of regional differences and population-level variations in caregiving-related outcomes.

Study population and eligibility

The study population consisted of children under five years of age (0–59 months) born to and living with an interviewed mother or under the care of an interviewed primary caregiver and identified in the survey's children recode (KR) dataset. The survey included children from all the administrative regions of Ethiopia.

Children were eligible if they had complete information on the components of the composite outcome variable (adequate caregiving practice) as well as the explanatory variables included in the analysis. Children with missing responses for the outcome or key predictor variables were excluded from the corresponding analyses, and the extent of missing data is reported alongside the results.

Sampling Procedure and Sample Size

The EDHS 2024–25 uses a nationally representative, stratified, two-stage cluster sampling design to select households and eligible respondents. The sampling frame was based on the most recent national census enumeration areas (EAs). In the first stage, EAs were selected as primary sampling units (PSUs) according to a probability proportional to size sampling. The selected EAs were stratified by region and place of residence (urban or rural) to ensure adequate representation of different geographic and population groups. In the second stage, a fixed number of households were systematically selected within each selected cluster. This design produced a nationally representative sample of women aged 15–49 years and their children under five years [20]. For this study, the analytic sample comprised 6,274 under-five children identified in the child recode dataset with complete data on the primary caregiving outcome, nested within 788 enumeration-area clusters. No additional primary sampling was undertaken, as the analysis relied entirely on the existing EDHS probability sample. Sample weights calculated by the DHS Program to account for the multistage, stratified design and differential probabilities of selection were applied in all descriptive and inferential analyses to restore national representativeness.

Data collection procedure and tools

The EDHS 2024–25 data collection was conducted via standardized procedures and tools developed according to the guidelines of the Demographic and Health Surveys (DHS) Program. Data were collected through structured, interviewer-administered questionnaires via electronic data collection devices (tablets). The survey employed the DHS model Woman's Questionnaire, adapted to the Ethiopian context and translated into relevant local languages to ensure accurate understanding and culturally appropriate

responses. Within the Woman's Questionnaire, the Child Health module (children recode, KR file) collected information on care-seeking for childhood diarrhoea, fever, and cough/acute respiratory infection; disposal of the youngest child's stools; breastfeeding and vaccination status; and the child's living arrangements, from which the composite caregiving outcome for this study was constructed [20].

Prior to fieldwork, data collectors and supervisors received comprehensive training on the study objectives, questionnaire administration, ethical considerations, informed consent procedures, interviewing techniques, and the use of electronic data collection devices. The questionnaire was pretested in selected areas outside the main survey sample, and modifications were made on the basis of pretest feedback. Data collection was conducted through face—to-face interviews with eligible women identified from selected households. Electronic data collection enables real-time data entry, automated skip patterns, consistency checks, and monitoring of data quality during fieldwork, and field supervisors regularly review completed interviews to ensure adherence to standardized procedures [20].

Variables of the Study

Outcome Variable

The primary outcome variable for this study is adequate caregiving practice, a composite binary indicator constructed from caregiving-related variables available in the 2024–25 EDHS children recode (KR) dataset. The composite was developed using indicators reflecting essential caregiving practices within the domains of child health, nutrition, hygiene, preventive care, and parental care [8], which is consistent with the Nurturing Care Framework [2] and the standard DHS child health modules [21].

The composite caregiving indicator comprises five domains. First, appropriate care seeking for childhood illness was assessed via treatment seeking for diarrhoea and fever/cough during the two weeks preceding the survey; children who experienced these symptoms and whose caregivers sought treatment or advice were classified as having received appropriate care, whereas children without either illness were considered to have met this criterion by default. Second, hygiene-related caregiving was measured via the method of disposing of the youngest child's stools, with safe disposal defined as using a toilet or latrine, rinsing the stools into a toilet or latrine, or burying the stools. On the other hand, disposal into drains or ditches, garbage, open, or other unsafe methods was classified as inadequate. Third, breastfeeding practices were included as age-appropriate indicators: current breastfeeding was assessed among children younger than 25 months, and exclusive breastfeeding was assessed only among infants aged 0–6 months. Fourth, preventive healthcare was assessed on the basis of the child's vaccination status, with children who had received at least one vaccination classified as meeting this criterion. Fifth, parental care and supervision were represented by whether the child was living with their biological mother at the time of the survey.

Because some caregiving practices are age specific, the composite outcome was constructed using only the indicators applicable to each child. A caregiving score was calculated by summing all applicable

caregiving indicators for each child and dividing by the number of applicable indicators to obtain a percentage of caregiving score. In reference to a previous study conducted by Kebede and colleagues [22], the outcome variable was coded as a binary variable, with children achieving at least 75% of applicable caregiving indicators classified as having adequate caregiving practice (coded 1) and those achieving less than 75% classified as having inadequate caregiving practice (coded 0). This approach ensured that children were assessed only on caregiving practices relevant to their age and eligibility, minimizing misclassification arising from age-dependent indicators such as breastfeeding.

Independent Variables

Independent variables were selected based on a multilevel conceptual framework recognizing the influence of individual-, household-, and community-level factors on caregiving behaviours. Consistent with the hierarchical structure of the 2024–25 EDHS data, where children are nested within mothers and households and households are further nested within enumeration-area clusters, explanatory variables are categorized into Level 1 (individual and household-level factors) and Level 2 (community-level contextual factors).

At the individual and household level (level 1), child-related characteristics included child age (< 6 months, 6–11 months, 12–17 months, 18–23 months, 24–59 months), child sex, birth order (first, second–third, fourth–fifth, sixth or higher), and living arrangement with the biological mother. Maternal characteristics included maternal age; educational attainment (no education, primary, secondary, or higher); current marital status; employment status (currently working or not working); and reproductive and behavioural factors, including the number of children ever born, number of living children, age at first birth, current pregnancy status, smoking status, and health insurance coverage. Household-level characteristics included the household wealth index quintile, household size (small [1–4], medium [5–6], large [≥ 7]), sex of the household head, and the number of children under five in the household. Maternal access to health information and services included media exposure (constructed from exposure to newspapers, radio, television, and internet), antenatal care attendance (categorized as fewer than eight visits versus eight or more visits, consistent with the WHO's revised antenatal care contact model), and place of delivery (health facility versus home).

At the community level (Level 2), the contextual variables included region/administrative zone and place of residence (urban or rural). Additional community-level indicators were generated through aggregation of individual-level responses within enumeration-area clusters, including the proportion of women within each cluster with secondary or higher education, the proportion of households belonging to the two lowest wealth quintiles, and the proportion of women exposed to at least one media source; because these aggregated proportions typically do not follow a normal distribution, the national median value was used as a threshold to categorize clusters into "high" (equal to or above the median) or "low" (below the median) community-level parameters.

Data Management and Statistical Analysis

Data cleaning and weighting

Following approval of dataset access by the DHS, the relevant EDHS children recode file (KR) was downloaded in Stata (.dta) format. Data cleaning included verification of the sample size against the published EDHS report; recoding of caregiving-related items into the composite outcome and its sub-indicators; assessment of missing-data patterns; and generation of the individual-, household-, and community-level explanatory variables described above. Children older than 59 months at the time of the interview were excluded because age was required for outcome and covariate construction. All analyses incorporated the DHS sampling weights, primary sampling unit, and strata variables via survey (svy) commands to account for the complex sample design, which is consistent with standard practices in published Ethiopian and sub-Saharan African DHS multilevel studies [15, 16, 18].

Descriptive analysis

Weighted descriptive statistics (frequencies and percentages) were used to summarize the sociodemographic, pregnancy/fertility-related, household, and community-level characteristics of the sample and to estimate the national and subnational (regional and urban/rural) prevalence of adequate caregiving practices. Bivariate associations between predictors and the outcome variable were examined via chi-square tests as a preliminary screening step, with the conventional threshold of $p \leq 0.20$ used to shortlist variables for multivariable modelling, a threshold widely used to avoid premature exclusion of potentially important confounders.

Multilevel modelling analysis

Because children and mothers in the EDHS are nested within enumeration-area clusters that share unmeasured contextual characteristics, standard single-level logistic regression would violate the assumption of independent observations and understate standard errors. A two-level multilevel (mixed-effects) logistic regression model was therefore used, with individual-level observations (Level 1) nested within community/cluster units (Level 2), following the general modelling approach applied in prior Ethiopian and sub-Saharan African DHS multilevel analyses of care-related outcomes [15, 16, 18].

Model building proceeded in four sequential stages, consistent with conventional multilevel modelling practices for DHS data: (1) a null (empty) model with no explanatory variables, fitted to partition the total variance in adequate caregiving practices into individual- and community-level components and to compute the intraclass correlation coefficient (ICC); (2) Model 1, including individual- and household-level (Level 1) variables only; (3) Model 2, including household- and community-level (Level 2) variables only; and (4) Model 3 (the final, full model), including individual-, household-, and community-level variables simultaneously, to obtain adjusted odds ratios (AORs) with 95% confidence intervals for all predictors while accounting for random variation across communities.

Model comparison and fit were assessed via the log-pseudolikelihood, the Akaike information criterion (AIC), and the Bayesian information criterion (BIC), with the best-fitting model selected as the final model. Random-effects/variance parameters were summarized via the ICC and the median odds ratio (MOR), which expresses unexplained cluster-level heterogeneity on the same odds ratio scale as the fixed effects do, facilitating direct comparison of the relative importance of individual- versus community-level factors. Statistical significance for fixed effects in the final model was declared at $p < 0.05$, with associations reported as adjusted odds ratios and 95% confidence intervals. All analyses were conducted via Stata version 19.2.

Ethical Considerations

This study used only deidentified, publicly documented secondary survey data and did not involve any new contact with human subjects; consequently, direct ethical clearance involving human subjects was not needed. Access to the 2024–25 EDHS dataset was obtained strictly through the DHS Program's formal data request procedure. The researchers registered as authorized users on the DHS Program website, submitted a dataset request specifying the research project title, a description of the proposed analysis, and contact information, and proceeded with analysis only after email notification of approval [23]. Because the requested data pertain to Ethiopia specifically, access was requested by country, in keeping with the DHS Program's principle that survey data remain the property of the host country government under bilateral agreements with the DHS Program [24].

In accordance with the DHS Program's Datasets Terms of Use, the researchers agreed to use the requested data solely for the stated research purpose described in this study; to store the data files securely and prevent access by unauthorized users; to treat all information as strictly confidential and make no attempt to identify any individual, household, or enumeration area; to refrain from redistributing the microlevel data without the written consent of the DHS Program; and to submit a copy of the resulting manuscript to the DHS Program Data Archive upon completion [25]. No results are published or presented in a form that would allow identification of any survey respondent, household, or enumeration area, and all findings are reported at aggregate, statistically deidentified levels only.

Results

Individual- and community-level characteristics

Table 1a presents the individual-level sociodemographic and socioeconomic characteristics of the 6,274 study respondents. Most children (60.62%) were aged 24–59 months. The distribution of children by sex revealed that 51.67% were males. With respect to birth order, the largest proportion of children (35.89%) were second- to third-born, followed by fourth- to fifth-born (22.03%), and first-born children (20.82%) were the lowest.

With respect to maternal characteristics, approximately one-third (31.06%) of mothers were aged 25–29 years, followed by those aged 30–34 years (21.80%). Nearly half of the mothers (45.36%) had no formal

education, whereas 33.07% had primary education. Similarly, 37.59% of the partners had no formal education, whereas 32.63% had primary education.

The majority of the respondents (90.52%) were married, while almost all mothers (97.04%) reported not smoking, and approximately two-thirds (65.43%) did not have health insurance coverage. Most respondents (89.81%) were living with their partners, whereas 72.00% of mothers were not employed at the time of the survey. With respect to partners' occupations, the majority (78.14%) were engaged in non-agricultural occupations.

Table 1
a: Sociodemographic characteristics of the study participants, EDHS 2024–25

Variables	Frequency	Percentage (%)
Child age		
< 6 months	688	10.97
6–11 months	634	10.11
12–17 months	634	10.11
18–23 months	515	8.21
24–59 months	3,803	60.62
Child sex		
Male	3,242	51.67
Female	3,032	48.33
Birth order		
First	1,306	20.82
Second–third	2,252	35.89
Fourth–fifth	1,382	22.03
Sixth or higher	1,334	21.26
Maternal age		
15–19 years	205	3.27
20–24 years	1,115	17.77
25–29 years	1,949	31.06
30–34 years	1,368	21.80
35–39 years	1,086	17.31
40–44 years	415	6.61
45–49 years	136	2.17
Maternal education		
No education	2,846	45.36
Primary	2,075	33.07
Secondary	803	12.80

Variables	Frequency	Percentage (%)
Higher	550	8.77
Partner education		
No education	2,194	37.59
Primary	1,904	32.63
Secondary+	1,738	29.78
Marital status		
Never in union	56	0.89
Married	5,679	90.52
Living with partner	228	3.63
Widowed	76	1.21
Divorced	144	2.30
Separated	91	1.45
Smoking status		
No smoking	6,088	97.04
Currently smoking	186	2.96
Health insurance		
No insurance	4,105	65.43
Health insurance	2,169	34.57
Living with partner		
No	602	10.19
Yes	5,305	89.81
Maternal employment		
No	4,517	72.00
Yes	1,757	28.00
Partner occupation		
Not working	1,022	17.39
Agriculture	263	4.48
Other occupation	4,592	78.14

The results in Table 1b show the household and community-level characteristics of the study respondents. Nearly two-thirds of the respondents (64.74%) reported no media exposure. More than one-third (36.71%) of the households belong to the poorest wealth quintile, followed by the poorer (18.47%) wealth quintile. With respect to household composition, 36.21% of the households had seven or more members, followed by those with five to six members (36.07%). Most households (77.06%) were headed by males, and 81.01% had one to two children under five years of age. Most respondents (90.99%) were either the household head or the spouse of the household head, whereas only 7.54% were daughters or daughters-in-law. Most household heads (64.12%) were aged 30–49 years, followed by those younger than 30 years (21.44%).

The respondents were distributed across all administrative regions of Ethiopia, with the largest proportions residing in the Somali (11.03%), Oromia (10.44%), and Afar (9.47%) regions. A greater proportion (72.03%) of the respondents lived in rural areas. At the community level, respondents were almost equally distributed between areas with high (50.21%) community education, high (50.73%) community poverty, and high (52.07%) community media exposure.

Table 1
b: Household and community-level characteristics of the study participants (N = 6,274), EDHS 2024–25

Variables	Frequency	Percentage (%)
Media exposure		
No media exposure	4,062	64.74
Any media exposure	2,212	35.26
Household wealth index		
Poorest	2,303	36.71
Poorer	1,159	18.47
Middle	892	14.22
Richer	793	12.64
Richest	1,127	17.96
Household size		
Small (1–4)	1,739	27.72
Medium (5–6)	2,263	36.07
Large (≥ 7)	2,272	36.21
Sex of household head		
Male	4,835	77.06
Female	1,439	22.94
Number of under-five children		
0	52	0.83
1–2	5,083	81.01
3–4	1,115	17.77
5	24	0.38
Relationship to household head		
Head/wife	5,693	90.99
Daughter/daughter-in-law	472	7.54
Other	92	1.47
Age of household head		

Variables	Frequency	Percentage (%)
Media exposure		
< 30 years	1,345	21.44
30–49 years	4,023	64.12
≥ 50 years	906	14.44
Region		
Tigray	502	8.00
Afar	594	9.47
Amhara	496	7.91
Oromia	655	10.44
Somali	692	11.03
Benishangul-Gumuz	376	5.99
Central Ethiopia	433	6.90
Sidama	401	6.39
South West Ethiopia	403	6.42
South Ethiopia	544	8.67
Gambella	335	5.34
Harari	302	4.81
Addis Ababa	261	4.16
Dire Dawa	280	4.46
Place of residence		
Urban	1,755	27.97
Rural	4,519	72.03
Community education		
Low	3,124	49.79
High	3,150	50.21
Community poverty		
Low	3,091	49.27
High	3,183	50.73

Variables	Frequency	Percentage (%)
Media exposure		
Community media exposure		
Low	3,007	47.93
High	3,267	52.07

Table 2 presents the pregnancy, fertility, and reproductive health characteristics of the 6,274 study respondents. The majority of mothers were not pregnant at the time of the survey (90.37%). With respect to fertility history, 40.56% of the respondents had given birth to three to five children, 34.62% had one to two children, and 24.82% had six or more children. More than half of the mothers (57.65%) had their first birth between 18 and 24 years of age, whereas 28.98% gave birth before the age of 18 years.

With respect to reproductive preferences, nearly three-quarters (72.68%) expressed a desire to have another child, whereas 18.43% reported wanting no more children. Decisions regarding contraceptive use were predominantly made jointly with partners (53.06%). With respect to maternal healthcare utilization, 56.15% of the mothers attended eight or more antenatal care (ANC) visits. Furthermore, 55.35% of the respondents delivered their most recent child in a health facility.

Table 2
Pregnancy, fertility, and healthcare-contact characteristics of the study participants, EDHS 2024–25

Variables	Frequency	Percentage (%)
Current pregnancy status		
Not pregnant	5,670	90.37
Currently pregnant	604	9.63
Children ever born		
1–2 children	2,172	34.62
3–5 children	2,545	40.56
≥ 6 children	1,557	24.82
Age at first birth		
< 18 years	1,818	28.98
18–24 years	3,617	57.65
≥ 25 years	839	13.37
Living children		
1–2 children	2,285	36.42
3–5 children	2,654	42.30
≥ 6 children	1,335	21.28
Fertility preference		
Wants another child	4,560	72.68
Undecided	558	8.89
Wants no more children	1,156	18.43
Contraceptive decision-making		
Woman decides	1,947	33.71
Joint decision	3,064	53.06
Partner/others decide	764	13.23
ANC visits		
< 8 visits	2,751	43.85
≥ 8 visits	3,523	56.15

Variables	Frequency	Percentage (%)
Current pregnancy status		
Place of delivery		
Home delivery	1,637	44.65
Health facility	2,029	55.35

Prevalence of adequate caregiving practices in Ethiopia

Figure 1 presents the weighted prevalence of adequate child caregiving practices across Ethiopia. Overall, the national prevalence of adequate caregiving practices was 77.3% (95% CI [74.9%, 79.5%]). Substantial regional variation was observed, with Central Ethiopia recording the highest prevalence of adequate caregiving practices (86.5%, 95% CI [81.2%, 90.5%]), followed by Amhara (82.9%, 95% CI [76.8%, 87.6%]), Addis Ababa (81.7%, 95% CI [75.6%, 86.5%]), Gambella (81.4%, 95% CI [75.9%, 85.9%]), Sidama (81.2%, 95% CI [75.4%, 85.8%]), and South Ethiopia (80.5%, 95% CI [75.2%, 84.9%]). In contrast, Afar (55.8%, 95% CI [49.7%, 61.6%]), Somali (59.5%, 95% CI [54.9%, 64.0%]), and Dire Dawa (67.3%, 95% CI [58.9%, 74.8%]) reported the lowest prevalence rates. These findings demonstrate considerable geographic disparities in child caregiving practices across Ethiopia.

Figure 2 illustrates the weighted prevalence of adequate child caregiving practices according to place of residence. Overall, adequate caregiving practices were more prevalent among children living in urban areas (80.8%, 95% CI [76.9%, 84.3%]) than among those living in rural areas (75.9%, 95% CI [72.8%, 78.7%]). Although adequate caregiving practices were relatively common in both settings, the higher prevalence observed among urban residents indicates an urban–rural disparity that may reflect differences in access to healthcare services, educational opportunities, media exposure, and other socioeconomic resources influencing caregiving practices.

Determinants of adequate caregiving practices: individual-level bivariate analysis

At the bivariate level, several individual and maternal characteristics were significantly associated with adequate caregiving practices (Table 3). Child age was significantly associated with adequate caregiving practices ($p = 0.003$), with children aged 12–23 months somewhat overrepresented among those with adequate caregiving. Birth order was also significant ($p = 0.011$), with first-born children being the highest group to experience adequate care (22.4% versus 18.1%) and children of sixth or higher birth order being less likely to experience adequate care (19.0% versus 23.7%).

Maternal education showed a statistically significant ($p < 0.001$) association, with only 40.0% of adequately cared for children having mothers with no education, compared with 51.3% among those inadequately cared for children, whereas the secondary education category was overrepresented among

those adequately cared for children (14.7% versus 7.7%). Media exposure was also strongly associated with adequate caregiving ($p < 0.001$), where 42.3% of those adequately cared for children had mothers with any media exposure, whereas only 31.9% of those inadequately cared for children did. Health insurance coverage ($p = 0.034$), the number of children ever born ($p < 0.001$), the number of living children ($p < 0.001$), partner education ($p = 0.003$), partner occupation ($p = 0.005$), antenatal care visits ($p = 0.003$), and the place of delivery ($p < 0.001$) were all significantly associated with caregiving adequacy, with health facility delivery showing one of the largest bivariate gaps (64.2% among those adequately cared for children versus 43.0% among those inadequately cared for children).

Child sex, maternal age group, maternal employment, smoking status, marital status, current pregnancy status, age at first birth, partner cohabitation status, fertility preference, and contraceptive decision-making were not significantly associated with caregiving adequacy at the bivariate level.

Table 3
Individual-level bivariate associations with adequate child caregiving practices, EDHS 2024–25

Variables	Inadequate caregiving (%)	Adequate caregiving (%)	P value
Child age			0.003
< 6 months	14.8	9.6	
6–11 months	11.1	9.6	
12–17 months	8.9	10.0	
18–23 months	7.3	9.9	
24–59 months	57.9	60.9	
Child sex			0.897
Male	52.3	52.0	
Female	47.7	48.0	
Birth order			0.011
First	18.1	22.4	
Second–third	33.8	37.7	
Fourth–fifth	24.4	20.9	
Sixth or higher	23.7	19.0	
Maternal age group			0.591
15–19 years	4.1	3.0	
20–24 years	16.0	18.2	
25–29 years	33.7	31.2	
30–34 years	20.6	19.6	
35–39 years	18.4	19.5	
40–44 years	5.3	6.5	
45–49 years	1.9	2.0	
Maternal education			< 0.001
No education	51.3	40.0	
Primary	32.1	36.3	
Secondary	7.7	14.7	
Higher	9.0	9.0	

Variables	Inadequate caregiving (%)	Adequate caregiving (%)	P value
Marital status			0.259
Never married	1.2	1.0	
Married	92.3	91.7	
Living with partner	3.4	2.4	
Widowed	1.0	1.0	
Divorced	1.2	2.7	
No longer living together	1.0	1.3	
Maternal employment			0.07
No	71.9	66.7	
Yes	28.1	33.3	
Media exposure			< 0.001
No media exposure	68.2	57.7	
Any media exposure	31.9	42.3	
Current pregnancy status			0.788
Not pregnant	92.7	92.3	
Currently pregnant	7.3	7.7	
Children ever born			< 0.001
1–2 children	27.6	40.1	
3–5 children	44.4	38.1	
≥ 6 children	28.0	21.8	
Age at first birth			0.549
< 18 years	34.3	31.3	
18–24 years	53.0	55.9	
≥ 25 years	12.7	12.9	
Number of living children			< 0.001
1–2 children	29.8	42.3	
3–5 children	45.9	38.8	
≥ 6 children	24.4	18.9	

Variables	Inadequate caregiving (%)	Adequate caregiving (%)	P value
Smoking status			0.062
No smoking	95.5	97.2	
Currently smoking	4.5	2.8	
Health insurance coverage			0.034
No insurance	57.3	51.0	
Health insurance	42.7	49.0	
Partner cohabitation status			0.435
Not living together	6.9	8.0	
Living together	93.2	92.0	
Fertility preference			0.275
Wants another child	70.7	71.3	
Undecided	10.3	7.9	
Wants no more children	19.0	20.8	
Contraceptive decision-making			0.653
Woman decides	33.2	30.9	
Joint decision	50.8	53.7	
Partner/other decides	16.0	15.4	
Partner education			0.003
No education	41.9	32.2	
Primary	35.5	38.3	
Secondary	22.7	29.5	
Partner occupation			0.005
Not working	13.4	8.4	
Agriculture	3.6	3.0	
Other occupation	83.0	88.6	
Antenatal care visits (ANC)			0.003
< 8 ANC visits	48.4	41.2	
≥ 8 ANC visits	51.6	58.8	

Variables	Inadequate caregiving (%)	Adequate caregiving (%)	P value
Place of delivery			< 0.001
Home delivery	57.0	35.8	
Health facility delivery	43.0	64.2	

Determinants of adequate caregiving practices: Household and community-level bivariate analysis

At the household and community levels, several factors were also significantly associated with caregiving adequacy at the bivariate level (Table 4). The household wealth index was strongly associated with caregiving practices ($p < 0.001$), with a clear gradient away from the poorest quintile: 21.3% of those adequately cared for children were from the poorest households, compared with 36.8% among those inadequately cared for children. Household size was also significant ($p < 0.001$), with small households (1–4 members) being overrepresented among those adequately cared for children (33.3% versus 21.3%) and large households (> 7 members) being underrepresented (29.7% versus 38.9%). The number of under-five children in the household was strongly associated with adequate caregiving ($p < 0.001$), with households containing a single under-five child overrepresented among those adequately cared for children (42.7% versus 21.9%).

Region was also significantly associated with caregiving adequacy ($p < 0.001$), which is consistent with the disparities described above, and place of residence was significant at the bivariate level ($p = 0.043$), with rural residence somewhat less favourable to adequate caregiving. The sex of the household head, the household head's age, and the relationship between the child and the household head were not significantly associated with the outcome variable.

Table 4
Household- and community-level bivariate associations with adequate caregiving practices, EDHS 2024–25

Variables	Inadequate caregiving (%)	Adequate caregiving (%)	P value
Household wealth index			< 0.001
Poorest	36.8	21.3	
Poorer	17.3	18.9	
Middle	16.0	18.8	
Richer	13.6	20.4	
Richest	16.5	20.6	
Household size			< 0.001
Small (1–4 members)	21.3	33.3	
Medium (5–7 members)	39.9	37.1	
Large (> 7 members)	38.9	29.7	
Sex of household head			0.177
Male	80.5	83.4	
Female	19.6	16.6	
Number of under-five children			< 0.001
0	0.4	0.9	
1	21.9	42.7	
2	56.1	45.9	
3	19.2	9.4	
4	1.8	1.0	
5	0.7	0.1	
Household relationship to child			0.756
Head/wife	93.4	92.7	
Daughter	5.6	6.4	
Other	1.0	0.9	
Household head age			0.123
< 30 years	17.9	20.0	

Variables	Inadequate caregiving (%)	Adequate caregiving (%)	P value
30–49 years	70.0	65.5	
≥ 50 years	12.0	14.6	
Region			< 0.001
Tigray	5.3	5.7	
Afar	2.5	0.9	
Amhara	18.5	26.3	
Oromia	45.1	37.9	
Somali	8.4	3.7	
Benishangul-Gumuz	1.0	1.1	
Central Ethiopia	2.5	4.7	
Sidama	2.8	3.5	
South West Ethiopia	2.6	2.8	
South Ethiopia	6.9	8.4	
Gambella	0.3	0.4	
Harari	0.3	0.3	
Addis Ababa	3.1	4.0	
Dire Dawa	0.6	0.4	
Place of residence			0.043
Urban	24.0	29.8	
Rural	76.0	70.2	

Multilevel determinants of adequate caregiving practices

Four models were compared to identify the individual-, household-, and community-level factors associated with adequate caregiving practices (Table 5). The full multilevel logistic regression model (Model 3) incorporates individual, household, and community-level variables simultaneously. It was selected as the final model because it showed the best overall fit, with the lowest AIC (3,300.44) among the individual- and household-level models. The null model indicated an ICC of 22.9% (95% CI: 18.7–27.9%) and an MOR of 2.57, meaning that nearly a quarter of the total variation in adequate caregiving practices was attributable to differences between communities even before any predictors were added. In the final full model, the ICC remained substantial at 25.2% (95% CI: 19.1–32.4%), with an MOR of 2.73,

indicating that unexplained community-level heterogeneity in caregiving adequacy persisted even after adjusting for the full set of individual, household, and community predictors.

At the individual level, child age was a strong and consistent predictor of adequate caregiving in the final model: compared with age under 6 months, age 6–11 months (AOR = 2.12, 95% CI: 1.28–3.51), 12–17 months (AOR = 2.50, 95% CI: 1.56–4.00), 18–23 months (AOR = 2.54, 95% CI: 1.46–4.43), and 24–59 months (AOR = 1.76, 95% CI: 1.13–2.76) were associated with significantly greater odds of adequate caregiving practices. Maternal smoking status was significantly and negatively associated with adequate caregiving practices (AOR = 0.35, 95% CI: 0.15–0.80), whereas health insurance coverage was significantly and positively associated with the outcome (AOR = 1.52, 95% CI: 1.04–2.23).

At the household level, a large household size (≥ 7 members) was significantly and negatively associated with adequate caregiving in the full model (AOR = 0.50, 95% CI: 0.27–0.91), as was living in a household with five under-five children (AOR = 0.06, 95% CI: 0.01–0.63) and having a household head aged 30–49 years relative to a household head under 30 years (AOR = 0.56, 95% CI: 0.34–0.93). Female headship showed a borderline negative association with adequate caregiving (AOR = 0.62, 95% CI: 0.38–1.00). The household wealth index, which was strongly significant at the bivariate level, was attenuated in the multilevel model and did not remain a statistically significant independent predictor once household composition and community-level variables were accounted for.

At the community level, region remained a significant predictor of adequate caregiving practices after adjustment. Relative to Tigray, children in Afar (AOR = 0.33, 95% CI: 0.17–0.64), Somali (AOR = 0.37, 95% CI: 0.19–0.73), and Dire Dawa (AOR = 0.37, 95% CI: 0.17–0.80) had significantly lower odds of adequate caregiving practices, whereas no region presented significantly higher odds than Tigray did in the fully adjusted model. Place of residence, community education, community poverty, and community media exposure were not independently significant predictors in the final model.

Table 5
Multilevel logistic regression models of determinants of adequate under-five child caregiving practices, EDHS 2024–25

Predictors	Model 0: AOR (95% CI)	Model 1: AOR (95% CI)	Model 2: AOR (95% CI)	Model 3: AOR (95% CI)
Individual-level variables				
Child age				
< 6 months	–	Ref	–	Ref
6–11 months	–	2.11 (1.29–3.46)**	–	2.12 (1.28–3.51)**
12–17 months	–	2.53 (1.57–4.07)***	–	2.50 (1.56–4.00)***
18–23 months	–	2.69 (1.55–4.66)***	–	2.54 (1.46–4.43)**
24–59 months	–	1.73 (1.11–2.70)*	–	1.76 (1.13–2.76)*
Birth order				
First	–	Ref	–	Ref
Second–third	–	1.21 (0.72–2.03)	–	1.42 (0.81–2.49)
Fourth–fifth	–	1.29 (0.60–2.76)	–	1.62 (0.69–3.77)
Sixth or higher	–	1.31 (0.24–7.18)	–	1.68 (0.29–9.77)
Maternal age, years				
15–19	–	–	–	Ref
20–24	–	–	–	0.57 (0.26–1.25)
25–29	–	–	–	0.62 (0.29–1.35)
30–34	–	–	–	0.87 (0.35–2.21)
35–39	–	–	–	0.89 (0.33–2.39)
40–44	–	–	–	0.59 (0.20–1.75)

Predictors	Model 0: AOR (95% CI)	Model 1: AOR (95% CI)	Model 2: AOR (95% CI)	Model 3: AOR (95% CI)
Individual-level variables				
Child age				
45–49	–	–	–	0.32 (0.07–1.54)
Maternal education				
No education	–	Ref	–	Ref
Primary	–	1.46 (0.95–2.26)	–	1.34 (0.88–2.06)
Secondary	–	1.74 (0.89–3.42)	–	1.63 (0.84–3.15)
Higher	–	1.25 (0.47–3.31)	–	1.20 (0.45–3.22)
Maternal employment				
No	–	Ref	–	Ref
Yes	–	0.86 (0.59–1.27)	–	0.78 (0.53–1.17)
Media exposure				
No exposure	–	Ref	–	Ref
Any exposure	–	1.03 (0.68–1.55)	–	1.02 (0.66–1.57)
Household wealth index				
Poorest	–	Ref	–	Ref
Poorer	–	1.49 (0.91–2.44)	–	1.25 (0.75–2.09)
Middle	–	1.37 (0.83–2.27)	–	0.98 (0.53–1.79)
Richer	–	1.52 (0.78–2.93)	–	1.16 (0.55–2.44)
Richest	–	1.88 (0.89–3.96)	–	1.10 (0.43–2.84)
Children ever born				

Predictors	Model 0: AOR (95% CI)	Model 1: AOR (95% CI)	Model 2: AOR (95% CI)	Model 3: AOR (95% CI)
Individual-level variables				
Child age				
1–2	–	Ref	–	Ref
3–5	–	0.43 (0.13–1.44)	–	0.55 (0.18–1.72)
≥ 6	–	0.44 (0.05–3.63)	–	0.61 (0.07–5.04)
Living children				
1–2	–	Ref	–	Ref
3–5	–	1.48 (0.45–4.85)	–	1.67 (0.50–5.64)
≥ 6	–	1.28 (0.25–6.70)	–	1.66 (0.31–8.75)
Smoking status				
Nonsmoker	–	Ref	–	Ref
Currently smoking	–	0.36 (0.15–0.83)*	–	0.35 (0.15–0.80)*
Health insurance				
No insurance	–	Ref	–	Ref
Health insurance	–	1.47 (1.00–2.15)*	–	1.52 (1.04–2.23)*
Partner education				
No education	–	Ref	–	Ref
Primary	–	1.07 (0.73–1.56)	–	0.97 (0.64–1.47)
Secondary+	–	0.89 (0.51–1.56)	–	0.84 (0.47–1.52)
Partner occupation				
Not working	–	Ref	–	Ref
Agriculture	–	1.31 (0.37–4.61)	–	1.24 (0.39–3.99)

Predictors	Model 0: AOR (95% CI)	Model 1: AOR (95% CI)	Model 2: AOR (95% CI)	Model 3: AOR (95% CI)
Individual-level variables				
Child age				
Other occupation	–	1.43 (0.88–2.32)	–	1.21 (0.72–2.02)
ANC visits				
< 8 visits	–	Ref	–	Ref
≥ 8 visits	–	1.07 (0.69–1.65)	–	1.13 (0.72–1.77)
Place of delivery				
Home delivery	–	Ref	–	Ref
Health facility	–	1.58 (1.08–2.31)*	–	1.43 (0.97–2.12)
Household composition variables				
Household size				
Small	–	–	Ref	Ref
Medium (5–6)	–	–	0.80 (0.58–1.10)	0.63 (0.36–1.11)
Large (≥ 7)	–	–	0.89 (0.62–1.28)	0.50 (0.27–0.91)*
Sex of household head				
Male	–	–	Ref	Ref
Female	–	–	0.87 (0.61–1.24)	0.62 (0.38–1.00)
Number of under-five children				
None	–	–	Ref	Ref
1	–	–	1.18 (0.45–3.11)	0.82 (0.17–3.95)
2	–	–	0.52 (0.20–1.35)	0.69 (0.15–3.22)
3	–	–	0.34 (0.12–0.95)*	0.58 (0.12–2.81)

Predictors	Model 0: AOR (95% CI)	Model 1: AOR (95% CI)	Model 2: AOR (95% CI)	Model 3: AOR (95% CI)
Individual-level variables				
Child age				
4	–	–	0.46 (0.07–3.03)	0.54 (0.05–6.00)
5	–	–	0.05 (0.01–0.47)**	0.06 (0.01–0.63)*
Household head age				
< 30 years	–	–	Ref	Ref
30–49 years	–	–	0.81 (0.57–1.13)	0.56 (0.34–0.93)*
≥ 50 years	–	–	0.91 (0.58–1.41)	0.74 (0.41–1.34)
Community-level variables				
Region				
Tigray	–	–	Ref	Ref
Afar	–	–	0.45 (0.29–0.70)***	0.33 (0.17–0.64)**
Amhara	–	–	1.34 (0.76–2.36)	0.89 (0.43–1.85)
Oromia	–	–	0.87 (0.56–1.34)	0.60 (0.33–1.09)
Somali	–	–	0.58 (0.37–0.90)*	0.37 (0.19–0.73)**
Benishangul-Gumuz	–	–	1.01 (0.61–1.66)	1.18 (0.58–2.41)
Central Ethiopia	–	–	2.04 (1.20–3.47)**	1.68 (0.82–3.43)
Sidama	–	–	1.01 (0.63–1.61)	1.09 (0.55–2.13)
South West Ethiopia	–	–	0.93 (0.58–1.48)	0.92 (0.49–1.75)
South Ethiopia	–	–	1.29 (0.82–2.03)	0.91 (0.50–1.68)

Predictors	Model 0: AOR (95% CI)	Model 1: AOR (95% CI)	Model 2: AOR (95% CI)	Model 3: AOR (95% CI)
Individual-level variables				
Child age				
Gambella	–	–	1.25 (0.75–2.07)	1.33 (0.63–2.78)
Harari	–	–	0.88 (0.51–1.51)	0.52 (0.26–1.03)
Addis Ababa	–	–	0.79 (0.47–1.34)	0.94 (0.41–2.18)
Dire Dawa	–	–	0.53 (0.31–0.89)*	0.37 (0.17–0.80)*
Place of residence				
Urban	–	–	Ref	Ref
Rural	–	–	1.08 (0.75–1.53)	0.82 (0.46–1.48)
Community education				
Low	–	–	Ref	Ref
High	–	–	1.16 (0.87–1.54)	1.30 (0.89–1.90)
Community poverty				
Low	–	–	Ref	Ref
High	–	–	0.76 (0.56–1.04)	0.82 (0.49–1.37)
Community media exposure				
Low	–	–	Ref	Ref
High	–	–	1.30 (0.97–1.74)	1.27 (0.84–1.91)
Model constant & random effects				
Constant (intercept, OR)	4.47 (3.90–5.12)***	0.75 (0.36–1.56)	7.81 (2.39–25.53)**	5.04 (0.64–39.44)
Cluster-level variance	0.98 (0.76–1.27)	1.09 (0.78–1.54)	0.80 (0.61–1.07)	1.11 (0.78–1.58)

Predictors	Model 0: AOR (95% CI)	Model 1: AOR (95% CI)	Model 2: AOR (95% CI)	Model 3: AOR (95% CI)
Individual-level variables				
Child age				
Intraclass correlation (ICC)	22.9% (18.7–27.9%)	24.9% (19.1–31.8%)	19.7% (15.6–24.5%)	25.2% (19.1–32.4%)
Median odds ratio (MOR)	2.57	2.71	2.35	2.73
Model fit statistics				
N (observations)	6,274	3,427	6,274	3,427
Number of clusters	788	769	788	769
Log pseudolikelihood	−3075.699	−1640.635	−2934.352	−1587.217
df	2	30	29	63
AIC	6155.40	3341.27	5926.71	3300.44
BIC	6168.89	3525.45	6122.29	3687.22

*Note: AOR = adjusted odds ratio; CI = confidence interval; MOR = median odds ratio; Ref = reference category; – = variable not included in the model. Model 0 = null (empty) model with random intercept only (N = 6,274; 788 clusters). Model 1 = individual/household-level factor model (N = 3,427; 769 clusters). Model 2 = community-level factor model (N = 6,274; 788 clusters). Model 3 = final full model including individual-, household-, and community-level factors (N = 3,427; 769 clusters).

**p < 0.05; **p < 0.01; ***p < 0.001*

Discussion

This study provides nationally representative, multilevel evidence on adequate caregiving practices among children under five years of age in Ethiopia.

National prevalence of adequate caregiving practices

This study revealed that 77.3% of Ethiopian children under five years of age engaged in adequate caregiving practices (i.e., meeting at least 75% of the age-applicable caregiving indicators used in this study). This composite estimate is higher than the prevalence typically reported for individual caregiving domains in the Ethiopian DHS literature. The National DHS-based analyses of exclusive breastfeeding, for example, have generally placed EBF coverage in the 50–60% range, with a 2019 mini-EDHS-based spatial and multilevel analysis reporting national coverage of approximately 56% and a 2016 EDHS-

based multilevel analysis reporting a similarly moderate level once individual and community factors were accounted for [26, 27]. ANC attendance at eight or more visits (58.8%) and delivery in a health facility (64.2%) were reported by mothers in this study. This gap between the composite estimate and the single-domain estimates arises from how the outcome was constructed. The 75% threshold allowed a child to be classified as adequately cared for despite falling short on one or two indicators, so long as most applicable domains were met; children who were moderately, rather than uniformly, well cared for were still counted as receiving adequate care. This finding should therefore not be read as evidence that caregiving gaps in Ethiopia are minor; rather, it indicates that deficits are concentrated in specific domains and among specific subgroups of children rather than being spread evenly across the population.

Regional and residence-based disparities in caregiving adequacy

This study revealed that adequate caregiving practices varied substantially across Ethiopia's administrative regions and by place of residence. Central Ethiopia recorded the highest prevalence of adequate caregiving (86.5%), whereas Afar (55.8%) recorded the lowest, with a gap of more than 30 percentage points between the best- and worst-performing regions. Most children in urban areas (80.8%) used adequate caregiving practices relative to rural children. These descriptive disparities were corroborated by the multilevel model, which demonstrated that, even after adjusting for the full set of individual and household characteristics, children in Afar (AOR = 0.33, 95% CI: 0.17–0.64), Somali (AOR = 0.37, 95% CI: 0.19–0.73), and Dire Dawa (AOR = 0.37, 95% CI: 0.17–0.80) had significantly lower odds of adequate caregiving than children in Tigray did. This confirms that the regional gap is not fully explained by differences in the demographic composition of each region's population.

The null model intraclass correlation coefficient of 22.9% indicated that nearly a quarter of the total variation in caregiving adequacy was attributable to differences between communities before any predictors were entered, and this figure remained essentially unchanged (25.2%) in the fully adjusted model, with a median odds ratio (MOR) of 2.73. This magnitude of unexplained community-level clustering is consistent with, and in some respects smaller than, what has been documented for other single-domain, community-clustered maternal and child health behaviours in Ethiopia [28, 29]. Similarly, multilevel and spatial analyses of exclusive breastfeeding in Ethiopia have identified statistically significant community-level variance components even after adjusting for individual-level predictors [26, 27]. These findings reinforce the broader methodological conclusion running through the Ethiopian DHS multilevel literature that caregiving-related behaviours cannot be adequately explained by individual and household characteristics alone, and single-level models that ignore clustering by enumeration area are likely to understate the true uncertainty around and mask meaningful contextual sources of caregiving disparities [26–29].

This regional pattern is consistent with findings from an assessment performed in Ethiopia on parenting practices, which revealed that children were least likely to receive adequate nurturing care in rural

households in households headed by individuals without completed primary education [8]. This finding also mirrors evidence gathered directly from Ethiopia's pastoralist and agrarian periphery that roughly half of the sampled households were food insecure and that food insecurity was significantly associated with factors such as female household headship and low maternal education [30]. These are precisely the kinds of structural constraints, rather than caregiver knowledge or intent, that underlie the comparatively poor caregiving practices observed in Somali, Afar, and other dispersed, resource-limited settings. This study further revealed that in Oromia, despite its large population share, the region contributed a smaller proportion of adequately cared-for children than would be expected from its sample size, underscoring that population size alone does not predict caregiving performance and that region specific, rather than uniformly national, interventions may be needed.

Individual-level determinants

At the individual level, child age was one of the strongest and most consistent predictors of adequate caregiving, with children aged 6 months and older having roughly two to two-and-a-half times higher odds of adequate caregiving than infants younger than 6 months. This pattern likely reflects the age-specific construction of the composite outcome itself, where very young infants are assessed against the additional, comparatively demanding criterion of exclusive breastfeeding, whereas immunization schedules and safe hygiene behaviours typically accumulate as children age. This age-patterning is broadly consistent with pooled multi-country evidence on related caregiving behaviours in sub-Saharan Africa, where the accumulation of caregiving milestones (for example, safe disposal of child faeces) with increasing child age is a recurring finding [31], and with Ethiopian multilevel evidence that treatment-seeking and other caregiving behaviours are patterned by child age and household context [29].

Maternal smoking was significantly and negatively associated with adequate caregiving in the final model in this study, although it was uncommon in this sample (2.96%), and the association should be interpreted with appropriate caution given the wide confidence interval. This association may reflect unmeasured confounding by household stress, poverty, or caregiver mental health rather than a direct causal pathway and warrants further investigation using instruments better suited to disentangling these pathways.

Health insurance coverage was significantly and positively associated with adequate caregiving (AOR = 1.52), which is consistent with the broader Ethiopian evidence base on community-based health insurance (CBHI) and health service utilization [32]. Specifically, in a 2024 systematic review and meta-analysis conducted in Ethiopia, households enrolled in CBHI were nearly three times more likely to utilize health services than non-enrolled households were, with insured households averaging 1.14 more health facility visits [32]. The present findings extend this evidence by showing that health insurance coverage is associated not only with general health-service utilization but also with a broader composite of caregiving behaviours spanning hygiene, immunization, and parental supervision. This suggests that Ethiopia's ongoing expansion of CBHI schemes may function as a lever for improving caregiving practices more broadly if awareness of covered services and benefit packages reaches enrolled households.

Notably, several individual-level factors that were strongly significant at the bivariate level, including maternal education, household wealth, and place of delivery, were attenuated and lost statistical significance in the fully adjusted multilevel model. This pattern suggests that much of their apparent bivariate influence on caregiving adequacy is mediated through, or confounded with, other correlated factors, such as child age, household composition, and regional context, rather than reflecting independent effects once the full hierarchical structure of the data is modelled. This finding is broadly consistent with Ethiopian multilevel evidence showing that maternal education, household wealth, and antenatal care attendance are strong, but not always independent, predictors of where and how women deliver [28, 33], which were themselves only marginally significant after adjustment in this study.

Household composition and structure

At the household level, a large family size (seven or more members) and having a maximum of five (5) under-five children in the household were both significantly and negatively associated with adequate caregiving, even after adjusting for wealth and other confounders. This finding is consistent with the "resource dilution" hypothesis, which holds that a fixed caregiver time and attention budget must be shared across more dependents, reducing the intensity of care or investment each child receives [34]. This finding also corroborates the pattern reported in a 34-country, multilevel analysis of safe child faeces disposal across sub-Saharan Africa, where households with fewer than five children had significantly higher odds of practising safe disposal than larger households did, even after adjustment for wealth, education, and residence [31]. Female-headed households were negatively associated with adequate caregiving in the fully adjusted model. This finding is broadly consistent with evidence from a community-based study in the South Omo Zone, Ethiopia, which revealed that female-headed households faced significantly greater odds of food insecurity than male-headed households did [30], although it diverges from national-level evidence on healthcare seeking, where mothers in female-headed Ethiopian households have been found to be more likely to seek care for a sick child [35]. This divergence may reflect differences in the specific caregiving domains captured by each outcome and merits further disaggregated investigation.

Policy and program implications

This study's findings have several implications for Ethiopia's child health and nurturing-care agenda. First, the persistence of substantial unexplained community-level variance, even in the fully adjusted model, indicates that individual targeted interventions alone are unlikely to close caregiving gaps. Hence, place-based programs that strengthen community health infrastructure, health-extension worker coverage, and local information systems in underperforming regions, particularly Afar, Somali, and Dire Dawa, are needed. Furthermore, the protective association between health insurance coverage and adequate caregiving strengthens the case for continued, and ideally accelerated, expansion of community-based health insurance, alongside explicit efforts to ensure that caregiving-relevant services (immunization, growth monitoring, and care-seeking guidance) are actively promoted within CBHI benefit packages, building on pooled national evidence that CBHI enrollment meaningfully increases service

utilization [32]. Moreover, the negative association between large household size and caregiving adequacy, together with the resource-dilution mechanism it suggests [34], indicates that family planning and birth-spacing programmes, in addition to their established maternal and reproductive health benefits, may carry ancillary benefits for the intensity and adequacy of caregiving that young children receive. The structural associations among female headship, food insecurity, and resource constraints documented in Ethiopia's own pastoralist and agrarian communities [30] further suggest that livelihood- and safety net-based interventions, rather than caregiving education alone, may be needed to reach the most vulnerable households. Finally, the age-patterned nature of the composite outcome, with the youngest infants showing the lowest attainment, points to the first six months of life, particularly around exclusive breastfeeding as a priority window for intensified caregiver support and counselling.

Strengths and limitations

This study's main strength is its use of the most recent, nationally representative EDHS 2024–25 data and a multilevel modelling framework that appropriately accounts for the clustered structure of the survey. This distinguishes it from the largely single-domain, single-level analyses that have characterized much of the prior Ethiopian caregiving literature. Nonetheless, several limitations should be acknowledged. First, the cross-sectional design precludes causal inference; associations reported here, including the smoking and insurance findings, should be interpreted as correlational. Second, the composite caregiving outcome, while grounded in the Nurturing Care Framework and standard DHS child health modules, necessarily reflects the specific indicators available in the EDHS children recode and does not capture the full breadth of the Framework's five components, particularly stimulation and early-learning activities and psychosocial responsiveness, which are not systematically collected in the standard DHS questionnaire [8]. Third, some caregiving indicators, such as care-seeking for illness and exclusive breastfeeding, are age restricted by design; however, while necessary to avoid misclassification, this means that the composite outcome is not perfectly comparable across the full 0–59-month age range, a limitation reflected in the strong age gradient observed in the multilevel model. Additionally, several point estimates in the final model, particularly for household composition categories with small cell sizes (for example, five under-five children in a household), had wide confidence intervals and should be interpreted with caution. Finally, as with all DHS-based analyses, caregiving behaviours were self- or proxy-reported by mothers, which may be subject to social desirability bias, particularly for hygiene- and health-related practices that are known to be socially endorsed.

Conclusion

This study revealed that just over three-quarters (77.3%) of Ethiopian children under five years of age received adequate caregiving, yet substantial regional and community-level disparities persisted beneath this national average, with a prevalence ranging from as low as 55.8% in Afar to as high as 86.5% in Central Ethiopia. This study's multilevel evidence shows that where a child lives matters nearly as much as who their caregiver is. This implies that a substantial share of the variation in caregiving adequacy is attributable to differences between communities rather than to individual or household characteristics

alone, and this contextual finding persists even after accounting for the most established individual- and household-level determinants identified in the study. Younger infants, children in large households with several under-five siblings, and children in Afar, Somali, and Dire Dawa emerge as priority groups for intensified support, whereas health insurance coverage stands out as a protective, policy-actionable factor. These findings point toward a caregiving agenda that combines individually targeted counselling and financial protection mechanisms with place-based investment in community health infrastructure and household livelihood security, particularly in pastoralist and historically underserved regions. Ethiopia's nurturing care framework commitments and the continued expansion of the Health Extension Program and community-based health insurance provide an institutional foundation on which such an agenda can be built. Achieving this goal will require sustained attention to the substantial regional and community-level disparities reported in this study.

Declarations

Ethics approval and consent to participate

This study used only deidentified, publicly documented secondary survey data and did not involve any new contact with human subjects; consequently, direct ethical clearance involving human subjects was not needed. Access to the 2024–25 EDHS dataset was obtained strictly through the DHS Program's formal data request procedure. The researchers registered as authorized users on the DHS Program website, submitted a dataset request specifying the research project title, a description of the proposed analysis, and contact information, and proceeded with analysis only after email notification of approval [23]. Because the requested data pertain to Ethiopia specifically, access was requested by country, in keeping with the DHS Program's principle that survey data remain the property of the host country government under bilateral agreements with the DHS Program [24].

Consent for publication

Not applicable.

Availability of data and materials

The data used for this study belongs to a third party and are available from The DHS Program. Restrictions apply to the availability of these data, which were used under licence for this current study. The dataset supporting the conclusions of this article is available in The DHS Program Portal (https://dhsprogram.com/data/available-datasets.cfm).

Competing interests

The authors declare that they have no competing interests.

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Contributorship statement

RK conceptualized the study, contributed to the study design and methodology, obtained access to the study data, managed and analysed the data, interpreted the findings, and led the preparation of the original manuscript. LK contributed to the literature review, methodology, interpretation of findings, and critical revision of the manuscript. JAD contributed to the literature review, methodology, interpretation of findings, and critical revision of the manuscript. SM contributed to the literature review, interpretation of findings, development of the discussion, and critical revision of the manuscript. LGG contributed to the literature review, interpretation of findings, contextualization of the Ethiopian child-health and caregiving findings, and critical revision of the manuscript. DED contributed to the methodology, interpretation of findings, contextualization of the results, and critical revision of the manuscript. SWK contributed to the methodology, review and interpretation of the statistical findings, and critical revision of the manuscript. HB contributed to the literature review, interpretation of findings, development of the discussion, and critical revision of the manuscript.

RK accepts full responsibility for the finished work and the conduct of the study and have access to the data.

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Figures

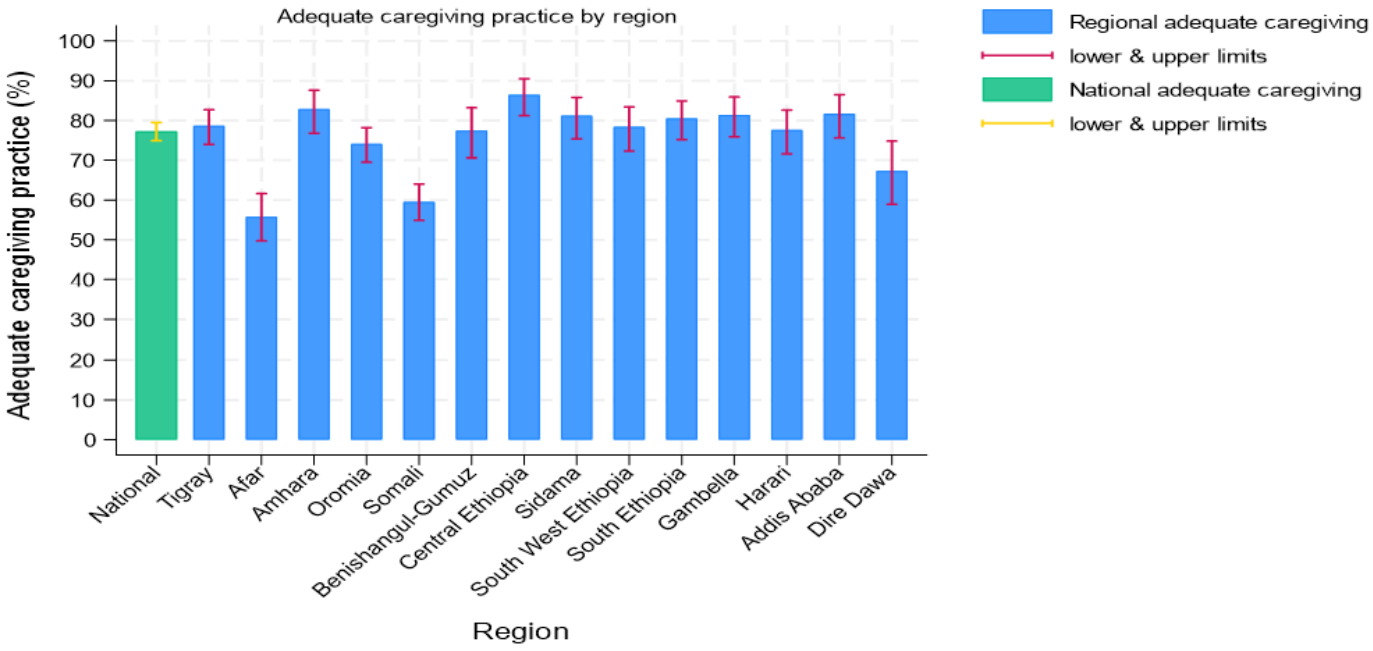


Figure 1

Weighted prevalence of adequate child caregiving practices by region, EDHS 2024–25

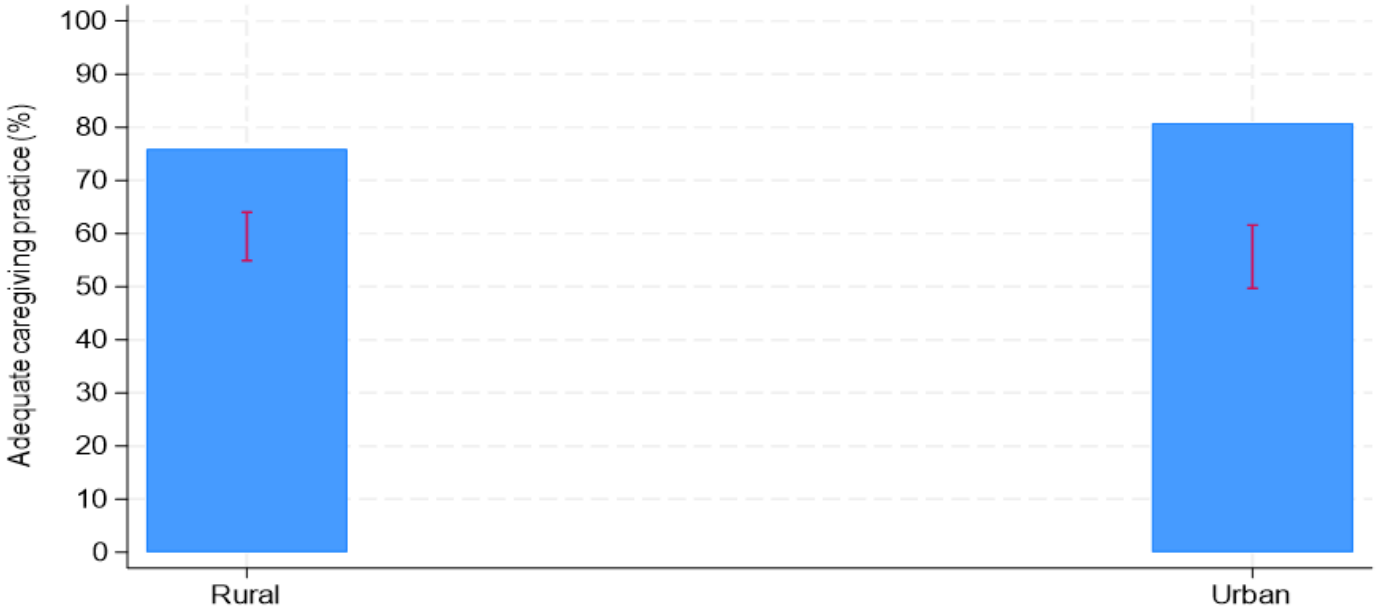


Figure 2

Weighted prevalence of adequate child caregiving practices by residence status, EDHS 2024–25