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Newborn thermal care practices in two urban slums in southern Ghana: evidence from a concurrent mixed methods study

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Abstract

Background In Ghana, neonatal deaths account for over 60% of infant deaths. While there are several studies examining the determinants of neonatal mortality and thermal care practices, few studies have focused on thermal care practices in urban slums. This paper examined newborn thermal care practices in two large urban slums in the southern part of Ghana.

Methods The data used for this paper comes from a concurrent mixed methods cross sectional study that was conducted in two large urban slums (Ashaiman and Sodom and Gomorrah) in Accra. The quantitative survey was conducted among 279 randomly sampled mothers aged 15–49 years with live neonates 0–28 days old. Focus group discussions (14) and 13 in-depth interviews were conducted with women of reproductive age with live newborns aged 0–28 days, slum based traditional birth attendants, care givers, community leaders and public health managers who were purposively selected. Descriptive analyses was conducted to describe newborn cord care practices in the slums. Bivariate and multiple logistic regression analyses were used to assess factors associated with cord care practices at a 95% confidence level. Qualitative interviews were tape-recorded, transcribed, coded and analysed thematically.

Results Prevalence of appropriate thermal care practices was 24.7%. Less than half of the neonates were dried or wiped before delivery of the placenta; 35% were wrapped, while majority of the newborns were bathed immediately or within 23 h after birth contrary to WHO recommendations. Several common newborn illnesses were reported including diarrhoea, fever, cough, acute respiratory infections, neonatal jaundice, and rashes. Mothers of newborns aged 25–34 years and those aged 35–44 years were more likely than those aged less than 25 years to provide appropriate thermal care to their newborns. The adjusted odds of receiving appropriate thermal care were higher among mothers who had skilled delivery compared to those who delivered without skilled birth attendants. Additionally, mothers of newborns residing less than 1–2 km away from the nearest health facility were more likely

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than those residing 3–5 km away from the nearest health facility and beyond 5 km away from the nearest health facility to provide appropriate thermal care for their newborns.

Conclusion Appropriate thermal care practices in Ghana's urban slums is low. A combination of demographic, socio-economic and behavioural factors (i.e. age, marital status, education, adequate utilization of antenatal care (ANC) and skilled delivery) determine whether appropriate thermal care is provided to newborn babies. Improving thermal care practices in Ghana's urban slums requires addressing these modifiable socio-economic and behavioural variables including strengthening ANC services, and access to routine pre- and immediate post-natal counselling for mothers.

Clinical trial number Not applicable.

Keywords Essential newborn care, Neonate, Appropriate thermal care, Skilled delivery, Urban slum, Antenatal care

Introduction

The first month of life is the most vulnerable period for child survival, with 2.4 million newborns dying in 2020 [1]. In 2020, nearly half (47%) of all under -five deaths occurred in the neonatal period (i.e. the first 28 days of life), an increase from 1990 (40%) [1, 2]. Most of these deaths occur during labour, delivery and the immediate post-partum period [2–4].

Despite investments in interventions to reduce neonatal morbidity and mortality, progress has been especially slow in sub-Saharan Africa, where the risk of dying within the first 28 days after birth for newborns is ten times compared to high income countries [2, 5]. Newborn survival in the first 28 days of life is very critical, because of vulnerability to infections and illness. This vulnerability is linked to the stress of delivery and the transition and adaptation from uterine life to ex-utero with the associated exposures to infections and other dangers [6]. The mother's behaviour right from conception to birth and the quality of care provided during this period are therefore very crucial for newborn survival and development [3].

The World Health Organisation has recommended appropriate thermal care as part of a global strategy of essential newborn care [1, 7]. Appropriate thermal care practices include drying (wiping) and wrapping the newborn immediately after birth, initiating skin-to-skin contact with the mother to promote bonding, and delaying the first bath until after 24 h after delivery. These appropriate thermal care practices are part of a broader Essential Newborn Care (ENBC) package, which includes skilled care at birth, birthing at a clean surface, neonatal resuscitation, the use of sterile equipment for cutting and tying the cord, immediate and exclusive breastfeeding for six months and prompt and appropriate care-seeking for sick and low birthweight newborns [8, 9]. Universal coverage of these essential interventions is for protecting newborns against hypothermia, which could reduce neonatal deaths by an estimated 71% [10, 11].

Newborns are unable to efficiently regulate their body temperature as adults, because of their immature thermoregulation systems. This makes them susceptible to rapid temperature drops, as a result, caregivers including skilled and unskilled attendants are expected to ensure an optimal thermal environment especially in the first few hours after birth to aid in the proper growth and development of the newborn.

Ideally, infants should be nursed in a thermo - neutral environment that has a core body temperature between 36.5 and 37.5 degrees Celsius. This neutral thermal environment is characterized by a temperature range within which heat production is at the minimum needed to maintain normal body temperature. This is "the environmental temperature range within which the oxygen and substrate consumption for thermoregulation of homeotherms is minimal" [12, 13],

Neonates who experience thermal stability within a thermo-neutral environment (TNE) demonstrate enhanced growth, decreased respiratory support, decreased oxygen requirements, increased glucose stability, reduced mortality and reduced morbidities associated with hyperthermia and hypothermia. Frequent or prolonged heat -losing episodes in infants who have limited heat producing and conserving resources may lead to "cold stress" " a condition in which the environmental temperature is below the lower critical temperature for thermoneutrality". In this environment neonates respond with vasoconstriction to minimize heat losses, and is often followed by a rise in metabolic rate that also increases heat production [14].The condition triggers additional metabolic defense mechanisms using more oxygen and glucose [15], leading to physiologic changes which can compromise the infant.

Therefore early detection of "cold stress" through monitoring the peripheral hand or foot temperature either by the birthing woman/mother and/or a traditional birth attendant or through the standard monitoring of the axillary or rectal temperature of infants using a thermometer by skilled birth attendants/health professionals can help avert neonatal deaths resulting from hypothermia during the few hours after birth and the first 28 days after delivery. Drying the baby immediately after delivery and wrapping with warm blankets and heat lamps can help prevent heat loss. A knitted hat is often placed on the

baby's head. Other measures to keep the baby warm during this period include placing the baby skin-skin on the mothers' chest or abdomen or through Kangaroo Mother care [10, 11]. Skin-to skin contact with the mother within the first hour after birth helps keep the neonate warm, in a thermoneutral environment thereby preventing hypothermia; it also keeps the baby calm, improves feeding outcomes and strengthens bonding between the baby and the mother [16] and in the case of preterm and low birthweight infants, or small/ sick newborns, Kangaroo mother care is strongly recommended [11, 17, 18].

Over the last decade, Ghana's urban population has been growing rapidly as a result of urbanization, resulting in the spread of slums across major cities. It is estimated that 39.7% of the 5.4 million urban population are now residing in slums [19]. Neonatal health outcomes are even worse in poor urban slums [20, 21]. Thermal care is crucial in slums because newborns particularly those born in resource poor settings are especially highly vulnerable to hypothermia, the life-threatening condition for neonates [16]. Most slums lack adequate health care infrastructure, clean water, adequate sanitation, hygiene, sufficient living area and durable housing thus making it difficult for caregivers to provide proper thermal care to newborns [20, 21]. In 2018, the Ashaiman Municipality and the Ashiedu-Keteke Sub Metropolitan areas recorded neonatal mortality rates that were higher than the national average of 25 deaths per thousand live births [22, 23]. The Government of Ghana recognizing the challenge of the high neonatal mortality burden in the country launched several pro newborn initiatives including the Ghana National Newborn and Child Health Advocacy and Communication Strategy (2015–2019), the Ghana MDG Acceleration Framework and Country Action Plan (MAF) and the Ghana National Newborn Health Strategy and Action Plan (2019–2023).

Despite these initiatives, neonatal mortality stagnated, clearly suggesting an urgent need for research into the contributory factors fueling the high neonatal deaths, particularly appropriate thermal care for newborns. Newborns are especially vulnerable in urban slum neighborhoods due to the overcrowding, insanitary and poor housing conditions that characterize these areas. Yet, the few studies conducted in urban slums thus far have focused on the social and economic vulnerabilities rather than population health [24–27] neglecting maternal newborn and child health. Therefore, this study aimed to assess newborn thermal care practices and associated factors in two large urban slums in the southern part of Ghana.

Methods

Study design and population

The data used for this paper comes from a concurrent mixed methods cross sectional study. The quantitative survey was conducted among 279 mothers aged 15–49 years with live neonates 0–28 days old. The qualitative study was conducted among women of reproductive age with live newborns aged 0–28 days, slum based traditional birth attendants who delivered a live baby between January 1st and June 30th 2020, care givers, community leaders and public health managers at national, regional, and sub national level.

Study area and sampling

The study was conducted in two large urban slums (Ashaiman and Sodom and Gomorrah) in Accra. These slums are similar, ethnically diverse, mostly poor, barely educated and generally unemployed. Their residents are mostly engaged in odd, non-permanent jobs including female head porterage popularly called Kayayei. They also have poor access to healthcare. The sample for the quantitative survey was 279 women of reproductive age 15–49 years with live births 0–28 days old, who resided in either Ashaiman or Sodom and Gomorrah for at least a year prior to recruitment. Women whose babies did not survive 28 days were excluded. Mother-baby pairs recruited for the qualitative research were also excluded from the survey and vice versa to avoid potential bias and confounding of the findings.

We conducted a household survey of mother- newborn pairs using multi-stage stratified simple random sampling. The 2010 Ghana Population and Housing Census (PHC) [28] formed the sample frame. According to the 2010 PHC, the average size of urban enumeration areas (EAs) is (185 households); slightly larger than the average size of rural EAs (114 households) [28]. The sampling frame contained information about the EA's location, type of residence and estimated number of residential households. In each study location, we randomly sampled twenty (20) EAs of clusters of slum settlements, giving a total of 40 EAs. Given that the average size of an urban EA is 185 households, sampling 20 EAs in each study location was sufficient to obtain at least 140 respondents from each site.

In the second stage, a household listing was carried out in all selected EAs to identify women with newborns that met the study inclusion criteria. The results of the household listing in each EA subsequently served as a sampling frame for selecting individual respondents in the third stage. A community level enumeration of all women with newborns aged 0–28 days was undertaken using a simple Enumeration Tool. The tool comprised basic information of the participants' name, community, length of stay in the slum, contact number, house address, and whether

the woman had a live newborn aged 0–28 days old. Following the identification and enumeration of potentially eligible women and newborns in each EA, we further screened to eliminate mothers who did not meet the study's inclusion criteria after which a register of all eligible respondents in each EA was created [27]. The total sample size of 280 was proportionately allocated among the twenty EAs in each study site ensuring that EAs with higher numbers of potentially eligible respondents were sampled more into the survey. Each of the potentially eligible respondents in each EA was given a unique number identifier (e.g., 001 … 00n). The numbered lists were exported into a google-based random number generator programme, where the required number of participants from each study location were randomly selected. Participants who were literate were given a participant's information sheet to help them make an informed decision. Non-literate participants received explanation about the study from trained research assistants in a language that they understood.

For the qualitative arm, we conducted 14 focus groups comprising 121 females and 17 males (8–10 per group) and 13 in-depth interviews following guidelines proposed by Guest et al. and Francis et al. [29, 30]. Recruitment of participants was purposive, and continued until saturation was reached on major issues that the qualitative component explored [31, 32]. We used the homogenous, expert and maximum variation or heterogenous purposive sampling methods [33] to select participants.

Instruments and data collection

The quantitative data were collected electronically on mobile android devices using the Computer Assisted Personal Interview (CAPI). CAPI is a dependable telemetry device that transmits data to a base station's computer. The data management software (Datacol[1]) facilitated real time data collection. The Datacol application was used to capture and transfer the data to an online central data storage server for live data monitoring, data cleaning and analysis. Quantitative data collection was conducted using an interviewer administered questionnaire. Upon successful completion of an interview, the data was saved on the mobile device and a new questionnaire automatically opened up for the next interview. The data was collected by trained professional nurses and midwives.

Qualitative data were collected using semi -structured open ended interview guides. Discussions in the FGDs lasted between thirty minutes and 1 h. All discussions were conducted in one of three local dialects *Twi*, *Ewe and Dagbani* depending on the dialect that was mostly spoken and understood by the participants. The in-depth interviews lasted between forty-five minutes and one hour. Discussions and interviews were tape-recorded and notes were taken to document observations about the interview content, the participants and the context.

Prior to data collection, all data collection tools were pre-tested and refined based on the pre-test results. We also trained two supervisors and ten data collectors from January 2–4, 2020. The training offered a hands-on approach on use of the Datacol application, interviewing skills, interpretation of the questions, response categories and anthropometry. The training also covered skills in diagnosing neonatal sepsis, diarrhea, acute respiratory tract infections (ARI), ethics and compliance with research issues on human subjects.

Variables

The primary outcome considered included appropriate thermal care practices (i.e. skin-to-skin and Kangaroo Mother Care, drying/wiping and wrapping the newborn prior to delivering the placenta, and delaying the first bath until after 24 h following birth). The independent variables included socio-demographic factors such as maternal age, marital status, education, ethnicity, religion, parity, sex of newborn, occupation of mother, income or socioeconomic status, mothers age at birth, migration status, ANC attendance, timing of first ANC visit, home or facility delivery and delivery type, caesarean or normal.

Analysis

The quantitative data set was exported to SPSS version 25.0 for cleaning and generation of derived variables using Stata IC Version 16. Data analysis was done in three stages - descriptive statistics, bivariate and multi-variable logistic regression. Socio-demographic background characteristics and categorical variables were described using frequencies, and percentages. The mean, standard deviation, median and inter-quartile range were used as summary statistics for normally distributed continuous and skewed variables.

In bivariate analysis, various outcome variables were described across independent variables using frequencies and percentages, while the Pearson's chi - square test was performed to assess the significance of association between categorical independent variables and categorical outcome variables. The Fischer's exact test was used to assess associations in situations where the assumptions of the Pearson's chi-square test was violated. A simple binary logistic regression model was used to estimate the crude odds ratios of the outcomes across all the

[1] *DataCol is a Computer Assisted Program for Interview (CAPI) which uses an* ***android-based tablet application*** *to facilitate easy and timely collection of data. This is a web platform built on geo-referenced database which allows data to be collected from the field using cell phone or Tablets. The system, a client/server, consists of a mobile (client) application which allows interviewers to send data from different locations using a mobile device. The data is sent to the web platform containing specific details relating to the interviewer on real-time basis.*

independent variables at 95% confidence interval. A multiple binary logistic regression model was then used to estimate the adjusted odds ratios and their corresponding confidence interval. To select variables into the final adjusted regression model, all variables that had overall p-values of 0.200 and below were first fitted together in a single model. Afterwards, any variable with a p-value greater than 0.3000 was dropped. This step was carried out in an iterative process until the model no longer had a variable with a p-value above 0.300. This process allowed for a reduction of the number of variables in the model to avoid over-fitting and multicollinearity, as well as underfitting. In the final model, all variables with p-values below 0.05 were considered statistically significant.

The qualitative data were analyzed thematically. This involved a number of steps. The audio recordings were transcribed verbatim in the local languages, and translated into English. Back translations were done on selected transcripts to check the accuracy of the translations and to verify inconsistencies. All the transcripts and interview notes were read and reviewed thoroughly, and notes made on hard copies of the transcripts. A preliminary coding structure and code book was developed which led to the next phase. In the second phase, we exported all the transcripts into NVivo 12.x64 windows, where the data were both deductively and inductively coded. Data coding continued until theoretical saturation was reached (i.e., where no new concepts emerged from successive coding of the data). The completed code structure was then applied to develop and report themes with verbatim quotes.

Results

This section presents the results of the study findings. It is divided into three parts, the first describes the socio-demographic background characteristics of the participants, the second describes the key thermal practices in the slums (covering summaries of both quantitative and qualitative findings) and lastly the factors associated with appropriate thermal care practices in the slums.

Socio –demographic characteristics of respondents

Table 1 presents the socio-demographic characteristics.

Maternal characteristics of respondents

Table 2 also shows maternal characteristics of the survey respondents.

Characteristics of newborns

Of the 279 newborns (50.2%) were males. There were slightly more male neonates (52.3%) in Ashaiman compared to Sodom & Gomorrah (47.9%). Also, (63.4%) of the newborns were aged 7–28 days (late neonates). Nearly one third (30.5%) of the neonates weighed less than 2.5 kg. Again, (85.7%) of the newborns were vaccinated at birth. Of those neonates that were immunised, (86.4%) were vaccinated against BCG while (77.4%) were immunised against poliomyelitis.

Prevalence of early essential newborn thermal care practices

Key thermal care practices we examined included drying, wiping and wrapping the newborn prior to delivering the placenta, skin-to-skin and Kangaroo Mother Care (KMC), and delaying the first bath until after 24 h following birth. Table 3 shows data on these practices.

Drying and wiping

Only about half (48.7%) of the babies were dried or wiped soon after birth and before delivery of the placenta compared to a third (26.9%) that were dried or wiped after delivery of the placenta. About 14% of the babies were not dried or wiped while (10.4%) of mothers could not recall if their babies were dried or wiped. Nearly twice as many newborns (63%) in Ashaiman were dried or wiped soon after birth and before delivery of the placenta compared to (35.4%) in Sodom and Gomorrah.

Skin- to- skin and Kangaroo mother care

Of the 279 mother- newborn pairs surveyed, (64.2%) received skin to skin care immediately after delivery (i.e. placing the newborn on the bare chest of the mother in between her breast immediately after birth) while almost (30%) did not receive skin–to-skin care after birth. Newborns in Sodom and Gomorrah (70%) were more likely than their peers in Ashaiman to receive skin to skin care (see Table 3).

Wrapping

Regarding wrapping the newborn, only 35.5% were wrapped soon after birth and before delivery of the placenta compared to 26% that were wrapped after delivery of the placenta. Regarding the type of materials that were used to wrap the babies, 40.9% were wrapped with the mothers' own cloth while (32.2%) were wrapped with cloths of other women.

Timing of the newborns first bath

Regarding timing of the newborns' first bath, less than half (42.3%) delayed bathing until after 24 h or more. Overall, mothers in Ashaiman were more likely than their peers in Sodom & Gomorrah to delay bathing the newborn until after 24 h after birth in accordance with recommended WHO guidelines.

Overall, only 69 (24.7%) of newborns received appropriate thermal care (i.e. dried/wiped before delivery of the placenta and delayed bathing until after 24 h after delivery).

Table 1 Socio –demographic characteristics of respondents

Characteristic	Ashaiman, *n* (%)	Sodom & Gomorrah, *n* (%)	Total, *n* (%)
N	**135**	**144**	**279**
Age of new-born mother, mean ± SD	29.4 ± 5.9	26.8 ± 5.8	28.1 ± 6.0
Age group			
<25 years	30 (22.2)	52 (36.1)	82 (29.4)
25–34 years	77 (57.0)	80 (55.6)	157 (56.3)
35–44 years	28 (20.7)	12 (8.3)	40 (14.3)
Marital status			
Currently married	88 (65.2)	82 (56.9)	170 (60.9)
Co-habiting	35 (25.9)	38 (26.4)	73 (26.2)
Not in union	12 (8.9)	24 (16.7)	36 (12.9)
Highest level of education			
No Formal Education	42 (31.1)	43 (29.9)	85 (30.5)
Primary	17 (12.6)	43 (29.9)	60 (21.5)
Middle School/JHS/JSS	44 (32.6)	43 (29.9)	87 (31.2)
Senior High School/SSS/VOC/TECH	26 (19.3)	14 (9.7)	40 (14.3)
Tertiary	6 (4.4)	1 (0.7)	7 (2.5)
Occupation			
Casual Labourer	7 (5.2)	25 (17.4)	32 (11.5)
Petty Trader	75 (55.5)	31 (21.5)	106 (38.0)
Student	3 (2.2)	- (0.0)	3 (1.1)
Salaried Worker	8 (5.9)	35 (24.3)	43 (15.4)
Housewife/Homemaker	17 (12.6)	- (0.0)	17 (6.1)
Apprentice	4 (2.9)	- (0.0)	4 (1.4)
Artisan	17 (12.6)	47 (32.6)	64 (22.9)
Kayayei	4 (2.9)	3 (2.1)	7 (2.5)
Parity median (IQR)	2.0 (1.0, 3.0)	2.0 (1.0, 3.0)	(1.0, 3.0)
1	44 (32.6)	51 (35.4)	95 (34.1)
2	46 (34.1)	42 (29.2)	88 (31.5)
3	30 (22.2)	33 (22.9)	63 (22.6)
>3	15 (11.1)	18 (12.5)	33 (11.8)
Religion			
Christian	111 (82.2)	98 (68.1)	209 (74.9)
Muslim	20 (14.8)	42 (29.2)	62 (22.2)
Other religion	4 (3.0)	4 (2.8)	8 (2.9)
Ethnicity			
Akan	45 (33.3)	29 (20.1)	74 (26.5)
Ga/Dangme	19 (14.1)	52 (36.1)	71 (25.4)
Ewe	44 (32.6)	15 (10.4)	59 (21.1)
Mole Dagbani	7 (5.2)	14 (9.7)	21 (7.5)
Others	20 (14.8)	34 (23.6)	54 (19.4)
Wealth index quintiles			
Poorest	12 (8.9)	43 (29.9)	55 (19.7)
Poorer	17 (12.6)	39 (27.1)	56 (20.1)
Middle	25 (18.5)	31 (21.5)	56 (20.1)
Richer	36 (26.7)	20 (13.9)	56 (20.1)
Richest	45 (33.3)	11 (7.6)	56 (20.1)
Distance to nearest health facility			
1–2 km	85 (63.0)	44 (30.6)	129 (46.2)
3–5 km	39 (28.9)	74 (51.4)	113 (40.5)
>5 km	11 (8.1)	26 (18.1)	37 (13.3)

Table 2 Maternal characteristics of respondents

Characteristics	Ashaiman, *n* (%)	Sodom & Gomorrah, *n* (%)	Total, *n* (%)
N	**135**	**144**	**279**
Place received antenatal care during most recent birth			
No ANC visit	20 (14.8)	11 (7.6)	31 (11.1)
Public facility	98 (72.6)	115 (79.9)	213 (76.3)
Private facility	17 (12.6)	18 (12.5)	35 (12.5)
Gestational age at first ANC visit			
No ANC visit	20 (14.8)	11 (7.6)	31 (11.1)
1st trimester	28 (20.7)	65 (45.1)	93 (33.3)
2nd trimester	86 (63.7)	58 (40.3)	144 (51.6)
3rd trimester	1 (0.7)	10 (6.9)	11 (3.9)
Number of ANC visits			
No ANC	20 (14.8)	11 (7.6)	31 (11.1)
1–4	15 (11.1)	40 (27.8)	55 (19.7)
4+	100 (74.1)	93 (64.6)	193 (69.2)
Number of tetanus injections received			
None	37 (27.4)	39 (27.1)	76 (27.2)
1 injection	39 (28.9)	57 (39.6)	96 (34.4)
2 + injections	59 (43.7)	48 (33.3)	107 (38.4)
Number of SP/Fansidar taken			
None	33 (24.4)	36 (25.0)	69 (24.7)
1–2 tablets	6 (4.4)	32 (22.2)	38 (13.6)
3 + tablets	96 (71.1)	76 (52.8)	172 (61.6)
Took Iron Folate Tablet Supplementation			
Yes	91 (67.4)	95 (66.0)	186 (66.7)
No/Don't know/Don't remember	44 (32.6)	49 (34.0)	93 (33.3)
Received counselling on pregnancy and new-born danger signs from a health professional			
Yes	102 (75.6)	104 (72.2)	206 (73.8)
No/Don't know/Don't remember	33 (24.4)	40 (27.8)	73 (26.2)
Received counselling on birth preparedness and facility delivery from a health professional			
Yes	103 (76.3)	106 (73.6)	209 (74.9)
No/Don't know/Don't remember	32 (23.7)	38 (26.4)	70 (25.1)
Place of delivery			
Home delivery	20 (14.8)	20 (13.9)	40 (14.3)
Public health facility	104 (77.0)	119 (82.6)	223 (79.9)
Private health facility	11 (8.1)	5 (3.5)	16 (5.7)
Had skilled delivery			
Yes	88 (65.2)	91 (63.2)	179 (64.2)
No	47 (34.8)	53 (36.8)	100 (35.8)
Delivered by caesarean section			
Yes	9 (6.7)	4 (2.8)	13 (4.7)
No	126 (93.3)	140 (97.2)	266 (95.3)
Length of stay at health facility after delivery			
None facility delivery	20 (14.8)	20 (13.9)	40 (14.3)
<24 h.	22 (16.3)	29 (20.1)	51 (18.3)
24–71 h.	56 (41.5)	43 (29.9)	99 (35.5)
72 + hrs.	24 (17.8)	38 (26.4)	62 (22.2)
Don't know/Don't remember	13 (9.6)	14 (9.7)	27 (9.7)
Temperature of baby taken in first 48 h after birth by health professional			
Yes	91 (67.4)	91 (63.2	182 (65.2)
No	44 (32.6)	53 (36.8)	97 (34.8)
Mother counselled on breastfeeding in first 48 h after delivery			
Yes	75 (55.6)	85 (59.0)	160 (57.3)

Table 2 (continued)

Characteristics	Ashaiman, *n* (%)	Sodom & Gomorrah, *n* (%)	Total, *n* (%)
No	60 (44.4)	59 (41.0)	119 (42.7)
Child weighed again within the first 48 h after delivery			
Yes	57 (42.2)	14 (9.7)	71 (25.4)
No	78 (57.8)	130 (90.3)	208 (74.6)
Mother counselled on new-born danger signs that require immediate care from health facility			
Yes	47 (34.8)	19 (13.2)	66 (23.7)
No	88 (65.2)	125 (86.8)	213 (76.3)
Received postnatal checks in first 48 h of birth			
Yes	119 (88.1)	125 (86.8)	244 (87.5)
No	16 (11.9)	19 (13.2)	35 (12.5)

In the FGDs, participants expressed mixed views and opinions about delayed bathing of the newborn. Overall, knowledge about the benefits of delayed bathing of the newborn was poor: while service providers were worried about the practice of bathing newborns with hot water and giving enema, some mothers held strong views about delayed bathing because of perceived pollution during the birthing process. They argued that because of the "bad blood", the fluids and the dirt, the babies must be bathed immediately after birth:

> *A community leader opined that:"Immediate bathing of the newborn is part of our culture, customs and tradition. The newborn must receive a first bath as welcome to our world from the ancestors. Besides all the dirt, the blood, the pollution must be cleansed off, if it is allowed to stay longer on the babies body, s/he will have body odour in the future, and it is not good. So if a woman delivers at home we bath the baby immediately" (58-year-old Community Leader, FGD Participant, Sodom and Gomorrah).*
>
> *Some of the mothers, when we discharge them the way they bath the babies with "hot water" and they give them enema is a problem. They say that the babies are coming from the ancestral world and so there is some toilet that has to come so they give enema. At times they put hot water on the fontanelle because they believe it is a sore that must be healed (IDI Participant, Ashaiman).*
>
> *As for me because of the blood and the other fluids on the child, if you don't bath the child immediately after delivery s/he will grow up with body odour, that is what my mother said (27- year-old mother, FGD Participant Ashaiman).*
>
> *Bathing the baby early is important because when your water [amniotic fluid] bursts, some of it can touch the baby, some women also defecate in the process of pushing, and some women also urinate, and so in the process of delivery if the mother defecates and all of that touches the baby, if you are asked not to bath the baby immediately, she will smell so as for me I will have to bath my baby immediately after birth (29- year-old mother, FGD Participant Ashaiman).*

During the FGDs, mothers reported that immediate bathing of the newborn was the norm when a mother gave birth at home and delayed bathing is not encouraged, because of traditional beliefs about pollution. However, mothers reported that small babies or low birthweight babies are not bathed immediately.

> *These children... I mean those that are too small, we do not let too much air get to them, so we do not bath them immediately (31-year-old mother, FGD Participant, Sodom and Gomorrah).*

There is however an emerging trend concerning the bathing of newborn babies to address concerns surrounding "dirt" and the "vernix caseosa", as well as "body odour". There appears to be a compromise where the mothers are counselled by health service providers to bath babies for the first time immediately after birth, but subsequently not bath them again until after the umbilical cord falls off. Thus, during the period between the first bath and until the cord falls off, newborn babies are only wiped. Regular bathing of the newborn thus resumes only after the cord is detached and falls off as narrated by a mother of a newborn:

> *First day they (the nurses) said we should bath them (newborn babies) for the first time, after bathing that first day we should not bath the baby till the cord falls off before we bath them again (39-year-old mother, FGD Participant, Ashaiman).*

Factors associated with appropriate thermal care practices

Bivariate analyses were first performed to identify sociodemographic, maternal and neonatal characteristics that are associated with appropriate thermal care practices.

Table 3 Thermal care practices

Characteristics	Ashaiman *n* (%)	Sodom & Gomorrah *n* (%)	Total *n* (%)
N	135	144	279
Child received skin-to-skin care immediately after birth			
Yes	78 (57.8)	101 (70.1)	179 (64.2)
No	46 (34.1)	37 (25.7)	83 (29.7)
Don't know/ Don't remember	11 (8.1)	6 (4.2)	17 (6.1)
Baby was dried or wiped soon after birth and before delivery of the placenta			
Yes, before delivery of placenta	85 (63.0)	51 (35.4)	136 (48.7)
Yes, after delivery of placenta	20 (14.8)	55 (38.2)	75 (26.9)
No	17 (12.6)	22 (15.3)	39 (14.0)
Don't know/ Don't remember	13 (9.6)	16 (11.1)	29 (10.4)
Baby was wrapped/covered soon after birth before delivery of the placenta			
Yes, before delivery of placenta	65 (48.1)	34 (23.6)	99 (35.5)
Yes, after delivery of placenta	13 (9.6)	59 (41.0)	72 (25.8)
No	4 (3.0)	1 (0.7)	5 (1.8)
Don't know/ Don't remember	53 (39.3)	50 (34.7)	103 (36.9)
Type of cloth/material used to wrap baby after birth if wrapped/ covered after birth (*N* = 171)			
Mother's cloth	27 (34.6)	43 (46.2)	70 (40.9)
Napkin	8 (10.3)	27 (29.0)	35 (20.5)
Towel	1 (1.3)	2 (2.2)	3 (1.8)
Other cloth	40 (51.3)	15 (16.1)	55 (32.2)
Don't know/ Don't remember	2 (2.6)	6 (6.5)	8 (4.7)
Length of time after birth before baby was bathed for the first time			
< 1 h	9 (6.7)	20 (13.9)	29 (10.4)
1–6 h	20 (14.8)	60 (41.7)	80 (28.7)
7–23 h	25 (18.5)	27 (18.8)	52 (18.6)
24 + hours	81 (60.0)	37 (25.7)	118 (42.3)
Newborn received appropriate thermal care			
Yes (Dried/wrapped before delivery of placenta/bathed 24 + hours)	53 (39.3)	16 (11.1)	69 (24.7)
No (Dried / wrapped after delivery of placenta/bathed < 24 h)	82 (60.7)	128 (88.9)	210 (75.3)

From bivariate analysis, socio –demographic factors such as the age of mother, marital status, previous location, region of previous location, wealth index quintile and distance to the nearest health facility were significantly associated with appropriate thermal care for newborns ($p < 0.05$). Maternal and neonatal factors that were associated with appropriate thermal care included number of ANC visits, timeliness of ANC visit, counselling received from a health professional on appropriate thermal care, where ANC care was received, place of delivery, type of delivery and newborn's weight at birth. To further assess the strength and direction of the association between the socio demographic and maternal and neonatal factors and receipt of appropriate thermal care, these variables were further examined in a multiple logistic regression model and odds ratios were estimated (see Table 4).

From the multiple regression model (Table 4), mothers aged 25–34 years (COR: 2.79, 95% CI: 1.34–5.81, $p = 0.006$) and 35–44 years (COR: 3.58, 95% CI: 1.52–9.39, $p = 0.004$) were significantly more likely to provide appropriate thermal care for their newborns compared to younger mothers aged 25 years and below. After controlling for potential confounders, the adjusted odds of a newborn receiving appropriate thermal care remained significantly higher among mothers aged 25–34 years (AOR: 2.76, 95% CI: 1.04–7.38, $p = 0.042$) and 35–44 years (AOR: 4.67, 95% CI: 1.04–20.90, $p = 0.044$) compared to younger mothers aged 25 years and below.

Compared to mothers residing 1–2 km away from the nearest health facility, the crude odds of a newborn receiving appropriate thermal care were significantly lower among mothers residing 3–5 km (COR: 0.14, 95% CI: 0.07–0.28, $p < 0.001$) and more than 5 km (COR: 0.18, 95% CI: 0.06–0.51, $p = 0.001$). After adjusting for potential confounders, the odds of newborns receiving appropriate thermal care continued to be significantly lower among mothers of newborns residing 3–5 km (AOR: 0.14, 95% CI: 0.05–0.37, $p < 0.001$) and 5 km and beyond (AOR: 0.22, 95% CI: 0.06–0.82 $p = 0.23$) away from the nearest health facility compared to mothers of newborns living within 1–2 km to a health facility.

Again, mothers who had skilled attendance at birth were 40 times significantly more likely to provide appropriate thermal care for their newborns compared to mothers who delivered at home with unskilled attendants (COR: 40.75, 95% CI: 7.90-210.12, $p < 0.001$). After controlling for potential confounders, the adjusted odds of a newborn receiving appropriate thermal care remained 20 times significantly higher among mothers of newborns who had skilled birth attendance compared to those who delivered at home with unskilled attendants (AOR: 20.47, 95% CI: 2.96–141.40, $p = 0.002$).

Also, the crude odds of a newborn whose mother was cohabitating were significantly less likely to receive appropriate thermal care (COR: 0.42, 95% CI: 0.21–0.84, $p = 0.014$) and mother of newborns who were not in a union (COR: 0.15, 95% CI: 0.04–0.57, $p = 0.005$) compared to newborns whose mothers were currently married. However, after controlling for potential confounders, marital status of the mother was no longer significantly associated with appropriate thermal care. Furthermore, newborns whose mothers previously

Table 4 Multi-variable logistic regression analysis of factors associated with appropriate thermal care

		Child received appropriate thermal care at birth				
	Total	Appropriate thermal care	Unadjusted binary logistic regression model		Adjusted binary logistic regression model	
Characteristics	***N***	***n* (%)**	**COR [95% CI]**	***P*-value**	**AOR [95% CI]**	***P*-value**
N	279	69 (24.7)				
Age group of new-born mother						
<25 years	82	10 (12.2)	1.00 [reference]		1.00 [reference]	
25–34 years	157	45 (28.7)	**2.79 [1.34, 5.81]**	**0.006**	**2.76 [1.04, 7.38]**	**0.042**
35–44 years	40	14 (35.0)	**3.78 [1.52, 9.39]**	**0.004**	**4.67 [1.04, 20.90]**	**0.044**
Wealth index quintiles						
Poorest	55	5 (9.1)	1.00 [reference]		1.00 [reference]	
Poorer	56	8 (14.3)	1.61 [0.51, 5.04]	0.414	1.64 [0.36, 7.38]	0.521
Middle	56	15 (26.8)	**3.43 [1.19, 9.86]**	**0.022**	**4.78 [1.02, 22.50]**	**0.048**
Richer	56	20 (35.7)	**5.16 [1.84, 14.49]**	**0.002**	3.07 [0.71, 13.29]	0.134
Richest	56	21 (37.5)	**5.56 [1.98, 15.58]**	**0.001**	2.53 [0.64, 9.98]	0.185
Distance to nearest health facility						
1–2 km	129	55 (42.6)	1.00 [reference]		1.00 [reference]	
3–5 km	113	10 (8.8)	**0.14 [0.07, 0.28]**	**<0.001**	**0.14 [0.05, 0.37]**	**<0.001**
>5 km	37	4 (10.8)	**0.18 [0.06, 0.51]**	**0.001**	**0.22 [0.06, 0.82]**	**0.023**
Weight of newborn at birth						
Normal birth weight	194	64 (33.0)	1.00 [reference]		1.00 [reference]	
Low birth weight	85	5 (5.9)	**0.14 [0.06, 0.34]**	**<0.001**	0.49 [0.13, 1.86]	0.292
Number of ANC visits during pregnancy						
No ANC visit	31	0 (0.0)	1.00 [reference]		1.00 [reference]	
1–4 visits	55	2 (3.6)	2.94 [0.14, 63.30]	0.490	6.01 [0.01, 2968.94]	0.571
4 + visits	193	67 (34.7)	**33.62 [2.03, 557.97]**	**0.014**	8.27 [0.02, 3916.28]	0.501
Place of delivery						
Home delivery	40	0 (0.0)	1.00 [reference]		1.00 [reference]	
Public health facility	223	63 (28.3)	**32.05 [1.94, 529.08]**	**0.015**	0.47 [0.00, 93.43]	0.781
Private health facility	16	6 (37.5)	**50.14 [2.61, 963.24]**	**0.009**	0.74 [0.00, 202.31]	0.915
Had skilled delivery						
Yes	179	68 (38.0)	**40.75 [7.90, 210.12]**	**<0.001**	**20.47 [2.96, 141.40]**	**0.002**
No	100	1 (1.0)	1.00 [reference]		1.00 [reference]	
Delivered by caesarean section						
Yes	266	62 (23.3)	1.00 [reference]		1.00 [reference]	
No	13	7 (53.8)	**3.78 [1.27, 11.21]**	**0.017**	1.36 [0.35, 5.39]	0.658

COR: crude odds ratio. AOR: adjusted odds ratio

resided outside Greater Accra region had significantly lower odds of receiving appropriate thermal care (COR: 0.51, 95% CI: 0.29–0.93, $p = 0.027$) compared to newborns whose mothers resided in the Greater Accra region previously. However, after controlling for potential confounders, previous residence outside of the Greater Accra region became insignificant with a newborn receiving appropriate thermal care.

Discussion

This study investigated appropriate thermal care in two large urban slums in Ghana. Appropriate thermal care is one of the recommended essential newborn care practices aimed at maintaining temperature, providing warmth and preventing hypothermia in newborns. The WHO recommends delayed bathing of the newborn baby for the first time up to a period of at least 24 h after birth, immediate drying and wrapping of the newborn to prevent hypothermia and early skin -to-skin contact with the mother in the first hour after birth [34]. Kangaroo mother care is also strongly recommended for newborns to avert hypothermia and especially for preterm and low birthweight infants and small/sick newborns [11, 17, 18]. In this study however, only about a quarter (24.7%) of the newborns received appropriate thermal care. This prevalence is higher than the rate reported in another study conducted in the Lawra district in northern Ghana, where only 5.2% of newborns were reported to have received optimal thermal care [35]. The rate reported in this study is however lower than that reported in another

study in La Dadekotopon in Accra where higher rates of optimal thermal care practices were reported [36].

About 64% of newborns received skin-to-skin contact with their mothers in the first hour after delivery while about 49% of respondent mothers reported that their babies were dried or wiped immediately after birth and before delivery of the placenta compared to 27% who were dried or wiped after delivery of the placenta. According to the WHO, skin-to-skin contact with the mother immediately after delivery helps to keep the neonate warm thereby preventing hypothermia; it also calms the baby, improves feeding outcomes, and strengthens bonding between the mother and the newborn [16]. Another important recommended early essential newborn thermal care practice is wrapping the newborn immediately after birth either with a towel, cloth or material before delivery of the placenta to keep the baby warm and to prevent hypothermia, as prolonged exposure to cold during the delivery process increases the risk of hypothermia. We found that only 35.5% of mothers reported that their newborns were wrapped immediately after delivery and before delivery of the placenta compared to 25.8% who reported that the newborns were wrapped after delivery of the placenta. Another 36.9% did not know or could not recall if their newborns were wrapped after delivery. It is possible that some of these mothers delivered through cesarean section and could not recollect what happened to their newborns after birth, or the mothers were tired as a result of stress from the delivery process.

The study also found that less than half (43%) of newborns first bath was delayed for at least 24 h as recommended by the WHO. While this is higher than the national average of 23.3% [37], immediate bathing of the newborn appears to be a norm in both slums where more than half of mothers (57%) reported that their newborns were bathed between one hour and 23 h after birth. The findings show that knowledge and awareness about the risks associated with early bathing and hypothermia is either low or there is a disconnect between awareness and practice, suggesting a need for both continued education as well as emphasis on practice.

In this study, the practice of bathing the newborn immediately after birth was largely driven by deep seated sociocultural beliefs around pollution of the birth canal, and the vernix caseosa being dirty. Lack of supportive sociocultural norms emphasizing delayed bathing of the newborn until after 24 h after delivery may partly account for the large number of mothers who favour immediate bathing against the WHO recommendation. Health Service providers do not appear to be abreast with policies on delayed bathing of the newborn. Similar findings have been reported in previous studies where early bathing of newborns was linked to concepts of dirt and pollution related to vernix caseosa in Tanzania [38] and India [39]. Globally, the practice of immediate bathing of the newborn has been associated with beliefs regarding the benefits of early bathing. Some of these include getting rid of the vernix caseosa to prevent future "body odour. These sentiments were echoed in qualitative themes in the present study. Similar observations were previously made in Nepal [40]; Pakistan [41] and in rural Ghana [42]. Given the deep- seated socio -cultural beliefs and norms around pollution of the birth canal and the vernix caseosa being dirty, behaviour change communication delivered to expectant mothers at prenatal clinics must emphasise the positive benefits of delayed bathing of the newborn up to 24 hours after delivery to include the protective effects of the vernix caseosa serving as an antioxidant, a skin cleanser, moisturizer, temperature regulator and a natural safe antimicrobial for newborns post- delivery [16, 43].

Additionally, women who delivered with skilled birth attendants are more likely to receive counselling on appropriate thermal care than those who delivered with unskilled attendants, and thence in a better position to apply that knowledge on thermal care for their newborns. Furthermore, nearness to health facilities implies increased access and opportunity for women to receive quality newborn care including skilled delivery and counselling on appropriate thermal care. The findings confirm previous studies on distance to health facilities being predictors of newborn care for example, physical and financial accessibility to health facilities was reported as a determinant to newborn care in Nigeria [44] while poor geographic accessibility to health facilities including distance and transport were reported in Uganda [45].

The findings of this study should however be interpreted with certain limitations in mind. First, only two of Ghana's urban slums were covered in this study. The findings may therefore not be generalisable to the rest of the country, nor to other countries with different contexts. Second, the study collected first-hand information from the respondents; however given the potential for recall bias, much depended on the respondents ability to recall services received and provided in their most recent birth. Additionally, there may be limitations resulting from social desirability bias, as some respondents may have provided responses in order to look good in the eyes of the researcher and to be perceived to be doing what they perceive to be right for their babies regardless of the reality. Third, the cross-sectional design of the study means that causality cannot be determined in this study. Finally, translation errors and errors resulting from interpretation of concepts in the qualitative data which could likely affect the study findings. However, we believe these errors, if at all, have been kept to the minimum given the data quality measures we implemented including

rigorous training of research assistants and back-to-back translation of some transcripts. Taken together, the results in this study shed light on important areas of newborn thermal care practices needing urgent attention in Ghana's urban slums.

Conclusions

Overall, prevalence of appropriate newborn thermal care (24.7%) was generally low. Immediate bathing of newborns due to perceptions of pollution, dirt and to prevent future body odour was a common practice. Factors that were positively associated with appropriate thermal care were age of the mother, educational attainment, marital status, use of ANC services, skilled delivery and knowledge and awareness of newborn danger signs. Therefore, greater improvement in appropriate thermal care practices among neonatal mothers in Ghana's urban slums could be attained through strengthening ANC, skilled delivery and improved counselling of neonatal mothers. Specifically, we recommended that routine counselling on appropriate newborn thermal care should be intensified during pre and postnatal clinics focusing on primigravida mothers. Given the deep-seated cultural beliefs surrounding immediate bathing of newborns and reluctance of young mothers to delay bathing their babies because of issues around pollution, body odour and vermix caseosa, it will be important to strengthen the "pregnancy schools" concept to allow peer learning on appropriate newborn thermal care. Finally, we recommend the Ghana Health Service should work with civil society and the private sector to launch a vigorous social and behaviour change communication campaign on optimal thermal care practices targeting mothers of newborns, other stakeholders on newborn thermal care and health service providers at all levels. Behaviour change interventions should be based on an understanding of the barriers and facilitators to behaviour change; and intervention strategies should reflect the context of slums.

Abbreviations

ANC	Antenatal Care
BCG	Bacillus Calmette-Guérin
CHPS	Community Based Health Planning and Services
ENBC	Essential Newborn Care
FGD	Focus Group Discussion
GAR	Greater Accra Region
KMC	Kangaroo Mother Care
LBW	Low Birth Weight
MICS	Multiple Indicator Cluster Survey
SP	Suphurdoxine pyrimethamine
WHO	World Health Organisation

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Author contributions

EAA conducted the study, developed data collection tools, gathered data, analyzed the findings, and prepared the initial manuscript. JKG, PBA, EA, and FG provided scientific guidance on the study's design, data collection, and analysis. All authors reviewed and approved the final manuscript.

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Data availability

The dataset (s) supporting the conclusions of this manuscript are available from the lead author upon request.

Declarations

Ethics approval and consent to participate

Ethical clearance was obtained from the Ghana Health Service Ethics Review Committee registration number GHS –ERC: 024/05/19). The study was conducted in accordance with the terms of the Helsinki Declaration. All study participants either thumb printed or signed informed consent forms before participating in the study. All interviews were conducted in private rooms, while focus group discussions were held in open spaces in either churches or classrooms. All participants were assured of confidentially. They were informed that participation was voluntary and they could refuse to answer any sensitive question/s or withdraw from the study at any point without any consequences. All ethical protocols regarding the handling of newborn babies such as taking their weights and temperature was adhered to in accordance with guidelines on research with human subjects.

Consent for publication

All participants gave consent for the study's findings to be published. All authors also consented to the publication of this manuscript.

Competing interests

The authors declare no competing interests.

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References

1. World Health Organization. Newborns: improving survival and well-being. 2020. Available from: https://www.who.int/news-room/fact-sheets/detail/newborns-reducing-mortality [cited Jan 5 2021].
2. UNICEF. Levels and Trends in Child Mortality Report November 2020. Available from: https://www.unicef.org/publications/index_101071.html
3. Bhutta ZA, Das JK, Bhal R, Lawn JE, Salam RA, Paul VK, Walker N. Can available interventions end preventable deaths in mothers, newborn babies, and still births, and at what cost? Lancet. 2014;384(9940):347–70.
4. Lawn JE, Blencowe H, Shefali O, Danzhen Y, Anne L, Peter W, Cousens SN. Every newborn: progress, priorities, and potential beyond survival. Lancet. 2014;384:189–205.

5. Wang H, Dwyer -Lindgren L, Lofgren KT. Global, regional, and National levels of neonatal, infant, and under-5 mortalities during 1990–2013: a systematic analysis for the global burden of disease study 2013. Lancet. 2014;384(9947):957–79.
6. WHO. (2006). Pregnancy, Childbirth, Postpartum and Newborn Care: A Guide for Essential Practice.
7. Narayanan I, Rose M, Cordero D, Faillace S, Sanghvi T. Perinatal / neonatal essential newborn care. Virginia: Basics Support for Institutionalizing Child Survival Project (BASICS II) United States Agency for International Development, Arlington; 2014.
8. WHO. (1996). Essential Newborn Care. Report of a Technical Working Group. Geneva.
9. Austin A, Langer A, Salam RA, Lassi ZS, Das JK, Bhutta ZA. (2014). Approaches to improve the quality of maternal and newborn health care: an overview of the evidence. Reproductive Health, 11(2).
10. Dickson KE, Kinney MV, Moxon SG, Ashton J, Zaka N, Simen-Kapeu A, Lawn JE. Scaling up quality care for mothers and newborns around the time of birth: an overview of methods and analyses of intervention- specific bottlenecks and solutions. BMC Pregnancy Childbirth. 2015;15(2):1–19.
11. WHO. (2003). *Kangaroo Mother Care: a practical guide.*
12. IUPS Thermal Commission. (2001). Glossary of terms for thermal physiology (third edition). *Japanese Journal of Physiology, 51 (2)*: 245–280 cited in Kyokan (2022) Early detection of cold stress to prevent hypothermia: A narrative review. SAGE Open Medicine, Volume 11: 1–7.
13. Gordon C, J. Thermal physiology of laboratory mice defining thermoneutrality. J Therm Biol. 2012;37(8):654–85.
14. El -Radhi A, Carroll S, Klein J. Pathogenesis of fever. In: El-Radhi A, Carroll S, Klein J, N, editors. Clinical manual of fever in children. Berlin Heidelberg; Springer; 2009. pp. 47–61.
15. Gandy G, Adamsons M, Cunningham KJ, N. Thermal environment and acid-base homeostasis in human infants during the first few hours of life. J Clin Invest. 1964;43(4):751–8.
16. WHO. (2017a). *Reaching the Every Newborn National 2020 Milestones*.
17. WHO. WHO recommendations for care of the preterm or lowbirthweight infant. Geneva: World Health Organization; 2022.
18. WHO. Kangaroo mother care: a transformative innovation in healthcare. Global position paper. Geneva:World Health Organization; 2023.
19. GSS. (2020). *2021 Population and Housing Census*.
20. Beguy D, Elung'ata P, Mberu B, Oduor C, Wamukoya M, Nganyi B, Ezeh A. Health & demographic surveillance systems profile:the Nairobi urban and demographic surveillance system (NUHDSS). Int J Epidemiol. 2015;44(2):462–71. https://doi.org/10.1093/ije/dyu251.
21. Lilford JR, Oyebode O, Satterthwaite D, Melendez-Torres GJ, Chen Y-F, Mberu B, Ezeh A. Improving the health and welfare of people who live in slums. Lancet. 2017;389:559–70.
22. AMHD. (2017). Annual Report.
23. AKSM. (2018) Annual Report.
24. Weeks JR, Hill A, Stow D, Getis A, Fugate D. Can we spot a neighborhood from the air? Defining neighborhood structure in Accra. Ghana Geoj. 2007;69(1–2):9–22.
25. Arku G, Luginaah I, Mkandawire P, Baiden P, Asiedu AB. Housing and health in three contrasting neighbourhoods in Accra, Ghana. Soc Sci Med. 2011;72(2011):1864–72.
26. Owusu-Ansah FE, Tagbor H, Togbe MA. (2016). Access to health in City slum dwellers: the case of Sodom and Gomorrah in Accra, Ghana. Afr J Prim Health Care Family Med, 8 (1).
27. Ganle JK, Batiema L, Ayamah P, Ofori EAC, Ameyaw EK, Abdul-Aziz S, Ankomah A. Family planning for urban slums in low-and middle -income countries: a scoping review of interventions /service delivery models and their impact. Int J Equity Health. 2021;20:186.
28. GSS. (2012). 2010 Population & Housing Census.
29. Guest G, Bunce A, Johnson L. How many interviews are enough?An experiment with data saturation and variability. Field Methods. 2006;18:59–82.
30. Francis J J., Johnston M, Robertson C, et al. What is an adequate sample size? Operationalising data saturation for theory-based interview studies. Psychol Health. 2010;25:1229–45.
31. Guba E, G. Criteria for assessing the trustworthiness of naturalistic inquiries. Educational Communication Technol J. 1981;29:75–91.
32. Silverman D. Interpreting qualitative data: methods for analysing talk, text and interaction. Volume 2. London: SAGE; 2001.
33. Creswell J. W. (2009). Research design: Qualitative, quantitative, and mixed methods approaches (3rd Edition ed.). Thousand Oaks, California: SAGE Publications Inc.
34. WHO. (1997). *Hypothermia in the newborn. In:Thermal protection of the Newborn: a practical guide, Geneva.*
35. Saaka M, Ali F, Vuu F. Prevalence and determinants of essential newborn care practices in the Lawra district of Ghana. BMC Pediatr. 2018;18(173). https://doi.org/10.1186/s12887-018-1145-4.
36. Ayete-Nyampong J, Udofia EA. (2020). Assessment of knowledge and quality of essential newborn care practices in La Dade Kotopon Municipality, Ghana. *PLoS*.
37. GSS. (2018b). *Ghana Maternal Health Survey 2017: Key Indicators Report*.
38. Shamba D, Schellenberg J, Hildon ZJ, Mashasi I, Penfold S, Tanner M. Thermal care for newborn babies in rural Southern Tanzania: a mixed-method study of barriers, facilitators and potential for behaviour change. BMC Pregnancy Child Birth. 2014;14:267.
39. Sharma J, Osrin D, Patil B, Neogi SB, Chauhan M, Khanna R, Zodpey S. Newborn healthcare in urban India. J Perinatol. 2016a;36:S24–31.
40. Yadav S. Newborn care: traditional practices in Nepal. Student BMJ. 2007;15:293–336.
41. Fikree SS, Tazeen SA, Jill MD, Rahbar MH. Newborn care practices in low socioeconomic settlements of Karachi, Pakistan. Social Sci Direct Med. 2005b;60:911–21.
42. Hill Z, Tawiah-Agyemang C, Manu A, Okyere E, Kirkwood B. (2010a-a). Keeping newborns warm: beliefs, practices and potential for behaviour change in rural Ghana. *Tropical Medicine & International Health, 15*(10), 1118–1124.
43. WHO. (2013a). *WHO recommendations on postnatal care of the mother and newborn. Maternal, newborn, child and adolescent health*.
44. Katung PY. (2001). Socio-economic factors responsible for poor utilisation of the primary health care services in a rural community in Nigeria. Niger J Med. 2001 Jan-Mar;10 (1):28 – 9. PMID: 11705051.
45. Wilunda C, Oyerinde K, Putoto G, Lochoro P, Dall Oglio G, Manenti F, Quaglio G. Availability, utilisation of quality maternal and neonatal health care services in Karamoja region, Uganda: a health facility -based survey. Reproductive Health. 2015;12:30. https://doi.org/10.1186/s12978-015-0018-7.

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