

# Maternal Health and Infant Nutrition Status Report 2023



THE  
ODA FOUNDATION

## ***Background***

Situated in the hills of the Kalikot District in the Karnali Province of Nepal, The Oda Foundation (OF) was co-founded in 2013 by Kalikot native Karan Singh and American citizen John Christopher. Named after its location in the village of Oda, the Foundation is a government-registered NGO with a 501(c)(3) arm in the US, which contributes to its community development work. From starting in healthcare in 2013, Oda Foundation's work has expanded to now include education, community empowerment, programs supporting youth and women, and sustainable agriculture. This report was conducted with the help and support of Oda Foundation staff to elucidate the factors associated with child malnutrition in the Mahabai-2 Municipality.

## ***Author Information***

Research efforts were led by Public Health Fellow, Britta Binde, and Resident Doctor In Charge, Dr. Arun Mandal. Data was collected by many members of the Oda Foundation's staff, including Krishna Singh, Sarita Singh, Bir Jung Thapa, and Sarmila Rai. Sarah Webb supported data analysis and report writing.



The Oda Foundation  
[www.odafoundation.org/](http://www.odafoundation.org/)  
Social Media: @odafoundation  
Contact: [info@odafoundation.org](mailto:info@odafoundation.org)

## ***Methodology***

In order to investigate the relationship between maternal health behaviors and circumstances and manifestations of malnutrition in mothers' respective infants between the ages of six and twenty-four months, a spoken interview was conducted with women attending the Mahabai Community Hospital with infants that met the above stipulations. Interviews were conducted in Nepali, with a native Nepali-speaking medical professional verbally giving the survey to women when they came to the hospital. Concurrently, anthropometric measurements were taken of both the mothers and the infants. These measurements included weight and height for both mothers and their infants, and MUAC for infants. This was a cross-sectional examination, with research being conducted from December 2022 to February 2023.

The intended survey coverage area was women within the Mahabai-2 Municipality, hence why the Mahabai Community Hospital was chosen as a data collection site. Due to its location, women from throughout the municipality would come to the hospital to seek medical attention. It should also be noted that all survey participants were women interested in seeking healthcare from medical professionals, and who came to the clinic for reasons related to illness for either them or their infant. As a result, there is most certainly a demographic of mothers and infants who were not reached with the design of this survey. In total, 47 women were interviewed. Survey respondents were read a consent statement at the beginning of the interview explaining the purpose of the survey and ensuring that their answers would be confidential, and that they could halt the interview and withdraw consent at any point during the interview. No women declined to participate.

Question topics included sociodemographic factors, general maternal health (including behaviors and beliefs during gestation), infant feeding practices, general infant health (including instances of other diseases and sanitation), and anthropometric measurements. WHZ and LAZ scores were determined using WHO Anthro software (v. 3.2.2). Data analysis was conducted using R studio (v. 4.2.2). *P* values are not mentioned in the discussion of the results. Due to the small sample size of 47 participants, no tests showed statistical significance. Consideration should also be taken into the limitations of the study, as the research participants

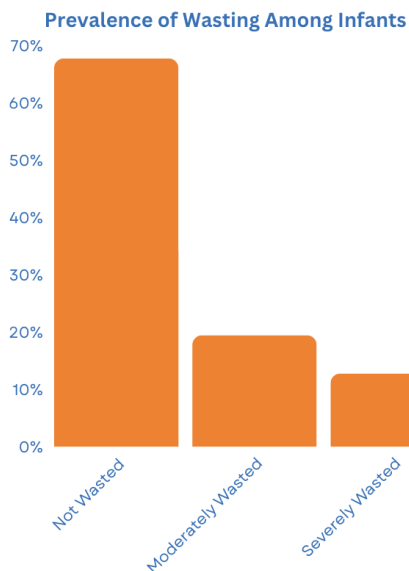
already demonstrated health-seeking behavior and were mostly first-time mothers.

## Results

### *Prevalence of Stunting<sup>1</sup> and Wasting<sup>2</sup>*

Child malnutrition may present in two different manifestations, known as stunting and wasting. Stunting is the name given to chronic malnutrition, and can be specifically identified when a child is more than two standard deviations (s.d.) for their length-for-age from the standard growth curve according to the World Health Organization (WHO) Child Growth Chart. Stunting is the result of prolonged periods of inadequate feeding and nutrition, as the body must first be of an acceptable weight to be able to grow in height. Wasting refers to acute malnutrition - reflecting a relatively shorter period of inadequate nutrition, and determined by a weight-for-height value of more than two standard deviations from WHO designated values. The classifications of both stunting and wasting can be categorized by either generic stunting or wasting (if the s.d. falls between -2 and -2.99), or severe stunting or wasting (for values less than -3). Throughout this report, s.d. will be referenced to examine child nutrition status for study participants. Following the age of 5 years, the effects of either stunting or wasting are considered irreversible, thus it is an issue that demands immediate action.

*Figure 1: Incidence of wasting*

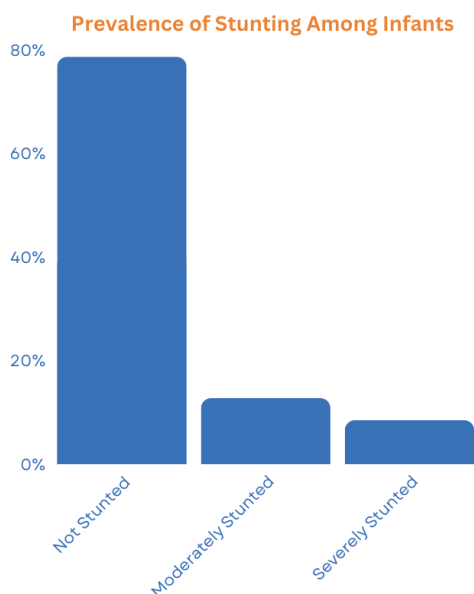


<sup>1</sup> Stunting is a manifestation of malnutrition in which the child or infant is at least two standard deviations below the normal growth curve for height-for-age. Stunting is considered chronic malnutrition and is irreversible after the age of 5 years.

<sup>2</sup> Wasting is defined as low weight-for-height. As acute malnutrition, it often manifests as severe weight loss and is associated with higher risk of death if left untreated.

Of the 47 infants that were measured in this study, 32% were considered wasted, meeting the criteria of a WHZ (weight-for-height) score of less than -2 standard deviations, with 19.15% moderately wasted, and 12.77% severely wasted. 21.28% of these infants were considered stunted by the same margin for LAZ (length-for-age) score, with 12.77% moderately stunted, and 8.51% severely stunted. Infants that were classified as both stunted and wasted in some capacity, scoring less than -2 s.d. for both WHZ and LAZ, were found at 12.8%. 46.8% of infants were either stunted, wasted, or both. These results demonstrate that there is substantial need for intervention and concentration on reducing the instances of malnutrition in the Mahabai 2 Municipality.

Figure 2: Incidence of stunting



Although this study concentrated on infants between the ages of 6 and 24 months, the national overall presence of wasting and stunting among under 5's in Nepal is 8%, and 25% respectively, according to the Nepal Demographic and Health Survey, 2022<sup>3</sup>. The incidence of wasting found among this demographic is substantially higher when compared to the national average. However, this may be due to the skew of a younger age, with infants suffering more from acute bouts of malnutrition (wasting) when they are younger, rather than chronic malnutrition (stunting). Repeated incidents of acute malnutrition have been correlated with the

<sup>3</sup> Ministry of Health and Population, Nepal; New ERA; and ICF. 2022. *Nepal Demographic and Health Survey 2022: Key Indicators Report*. Kathmandu, Nepal: Ministry of Health and Population, Nepal.

development of chronic malnutrition, if left untreated. Thus, it is imperative that proper attention is given to reducing the incidence of wasting that may contribute to the higher percentage of stunted children under-5 when considering the national average.

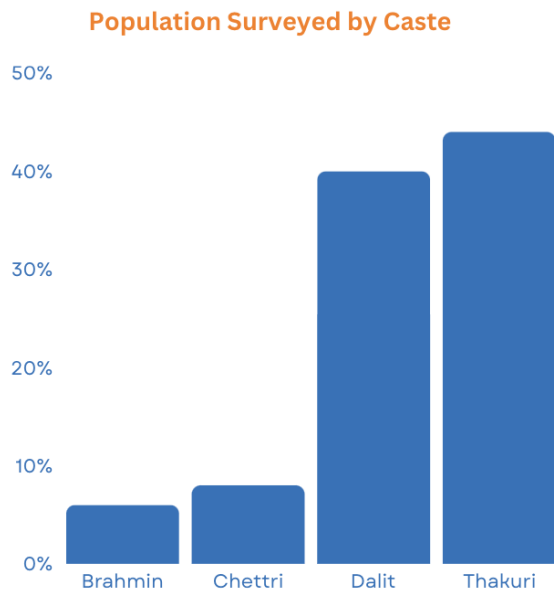
Mid-upper arm Circumference (MUAC) scores were used as another parameter of malnutrition status among infants, specifically for wasting. MUAC tape is considered a quick, easy-to-use malnutrition screening tool, which may be more accessible to rural clinics with limited staffing and resources. Thus, MUAC measurements for infants were taken for further comparison against the more formally recognized WHZ scores for wasting. MUAC tape is only reliable for screening infants for acute malnutrition, so stunting rates were not considered. Relative to the wasting incidence found using WHZ scores of 32%, using MUAC tape, only 17% of infants were identified as wasted (MUAC < 12.5cm). This demonstrates that while MUAC tape may be a quick and efficient tool for measuring acute malnutrition status, there are many cases that will go undetected by relying on it alone. MUAC may best be considered for its accuracy in screening for mortality risk rather than risk of wasting or chronic malnutrition.

### ***Sociodemographic Information***

#### *Ethnic Distribution*

The Mahabai Community Hospital is located in a predominantly Dalit and Thakuri community in the village of Oda, hence, the sociodemographic statistics reflect the large number of the Dalit and Thakuri women inhabiting the area. Of the survey participants, 44% were Thakuri, 40% were Dalit, 8% were Chettri, and 6% Brahmin. Dalit women have historically experienced social stratification and discrimination in Nepal, and as a result, many have more difficulties advancing financially and socially. This can often include increased barriers in accessing quality food, healthcare, and education. The average WHZ score (wasting) for Dalit members from this survey was -1.75, lower than other ethnicities at -1.52 (Thakuri), -1.26 (Chettri), and -0.96 (Brahmin).

Figure 3: Ethnic distribution



### Education and Occupations

In the Kalikot District, access to quality education has persisted as a struggle, especially for women. This absence from school is expedited by both children needing to assist their families working in the fields, and by the practice of *chhaupadi*<sup>4</sup>, a period of exile limiting women and girls from participating in normal activities while menstruating and immediately postpartum. This practice extends to additional barriers to education, as girls are not allowed to cross bridges when they are practicing *chhaupadi*, as is necessary for many children to reach school. The education levels of participating mothers were examined to explore the relationship with the health outcomes of infants. The predominant education level of mothers surveyed was Secondary, at 40%, followed by Higher Secondary with 36%, Illiteracy at 12%, and Informal/Primary at 10%. Comparing WHZ and LAZ scores with these parameters, the results showed that the average WHZ score for Illiterate mothers was -1.24, Informal/Primary was -1.60, Secondary was -1.93, and Higher Secondary was -1.22. Average LAZ scores for the same categories were -1.07, -0.36, -1.53, and -1.30.

Mother's occupation was also explored to determine whether there were any trends

---

<sup>4</sup> *Chhaupadi* is defined as a form of menstrual taboo which prohibits women and girls from engaging in daily activities while menstruating and immediately postpartum. Practices vary, but may include women being exiled to sheds or separate rooms, not being allowed to participate in celebrations, restricting certain foods, prohibition from the kitchen and from crossing bridges.

between jobs that may take mothers away from providing childcare, or jobs that may lead to more financial security within a household. Participants were allowed to select several occupations that best fit their experience. Economic opportunity is very limited within the municipality, with 61% of women claiming housework as their occupation, 53% agriculture, 8.5% pasal (small convenience stores), 6% other (involving healthcare worker, etc.), and 2.13% as teacher. The average WHZ scores for these occupations were -1.16 (Housework), -1.88 (Agriculture), -2.33 (Other), -2.90 (Pasal), and 0.61 (Teacher). Average LAZ scores showed different results, with -0.97 (Housework), -1.32 (Agriculture), -1.80 (Other), and -2.32 (Teacher).

*Table 1: Percentage of reported occupation based on when a mother returned to work after giving birth*

<b>Return to Work</b>	<b>Agriculture</b>	<b>Housework</b>	<b>Pasal</b>	<b>Teacher</b>	<b>Other</b>
<i>Immediately</i>	100%	0%	0%	0%	0%
<i>One week</i>	75%	25%	0%	0%	0%
<i>Two weeks</i>	60%	40%	0%	0%	0%
<i>One month</i>	70.30%	18.90%	0%	0%	10.80%
<i>Two to five months</i>	50%	33.30%	11.10%	5.56%	0%
<i>Six months or more</i>	53.30%	26.70%	13.30%	0%	6.67%

Mothers were also asked about when they returned to work after giving birth. With most mothers being self-employed, no clear stipulations are in place for when a mother should resume working after having a child. As most of these women may not follow a strict work schedule considering what their work entails, it is unclear in what capacity mothers returned to work when they did. Most mothers responded that they returned to work “After one month” (31.9%), closely followed by “Two to five months” (20.8%). Based on *Table 1* above, it is evident which occupations returned to work more quickly than others, with mothers working in agriculture being the only ones to report returning to work immediately after giving birth. This question was asked to determine how much rest women tended to take after giving birth in order to properly recover from childbirth and pregnancy, and have adequate time to care for the demands of a newborn.

An additional survey question asked mothers who took care of their children while they were working. Understanding who is the primary caretaker of young infants is important to gauge if they are still able to adequately breastfeed in the event infants are removed from their



mothers, or if a mother bringing her infant with her and exposing them to labor conditions has a detrimental effect on the health status of the infant. It may also help to direct potential social or behavioral change interventions, since mothers are likely not the only caretakers of infants. According to survey results, most mothers reported that their infants were looked after by their grandparents at 49%. The infants whose mothers responded that their infants were watched by other children in the family, or who reported bringing their infant to work with them, showed the worst health outcomes by the parameters of WHZ scores, at -2.96 (n = 2), and -2.29 (n = 13), respectively. Those reportedly taken care of by grandparents had the highest average WHZ score, of -1.27.

### *Birth Interval and Age*

This study also investigated the incidence of birth interval length between children. As WHO recommends 36 months birth spacing for women in very low-resource settings in order to minimize health risk, this higher parameter was used as the baseline for this study<sup>5</sup>. The notion of birth spacing is intended to allow a mother's body to recover properly – with health benefits to both the mother and the infant – and to allow her to give full attention to the care of one infant at a time. Longer time intervals between births may be generally advised because of the financial burden of each additional child added to a family, as well as having another mouth to share food with. The results of this study showed very marginal differences between participants who met the criteria for appropriate birth spacing and those who didn't, with average WHZ scores of -2.29 and -1.52 respectively. These results may show that although spacing between having children still may be recommended by WHO - and therefore the information should be disseminated at health visits - it may not be a priority to emphasize in this community. It should also be considered that the mothers who were measured for appropriate birth spacing were the ones with several infants as well, which could additionally contribute to poor health outcomes.

The study also evaluated the age of the mother when she had her first child, with 51% of mothers under the age of 19 when they had their first child. However, for all categories of ages at first childbirth, including: "Under 19", "20-24", "25-29", and "Over 30", the lowest average WHZ score was -1.74 for mothers in the 25-29 age group (n = 16). Note that this was considering the age of mothers at their first childbirth, being related to the health status of their *youngest* infant, and not necessarily their firstborn. The average age of mothers included in this

---

<sup>5</sup> World Health Organization (WHO). (2007). *Report of a WHO "technical consultation on birth spacing."* Geneva, Switzerland: World Health Organization. Retrieved

survey was 27 years, though the median age was 24. The median age of 24 was used for analysis, due to the outliers of age that resulted in data skew of the average age of 27. Using the median age of 24, the average WHZ score of -1.24. From this it may be possible to deduct that while research has indicated that having children under the age of 19 may increase the risk of poor health outcomes for the infant, it's possible that this risk does not apply to children that the mother may have later in life. For the women in the survey who were under the age of 20, the average WHZ score of their infants was -2.78 (n = 11), a considerably low score. As such, education around associated risks of having children at an early age should still be emphasized. This education should also be supplemented with education, awareness, and access for family planning or pregnancy prevention for women and their families who want to avoid pregnancy. Waiting for an older age to have children may see women in more financially stable situations, with furthered education, and more opportunities in general.

The sex breakdown of the infants in this study was 51% male, and 49% female. Males had a slightly lower average WHZ score of -1.84, compared with -1.25 for females. This is opposite to what was expected, considering there have been spoken accounts of girls receiving poorer care compared with their male counterparts due to prominent gender bias.

### *Food Security*

Mothers were asked how long their crops would last in providing food in order to get an idea of family food security and how it may be impacting infant health outcomes. The results demonstrated that food security has a large influence over the health outcome of infants. For the response, "I don't grow crops," the average WHZ score among infants was -2.45 (n = 4). The second lowest WHZ score was for crops lasting a duration of 1-2 months, at -1.78 (n = 8). These results, however, were not replicated with significantly low LAZ scores. This data helps to elucidate to what degree poor health outcomes could be related to a deficit in childcare knowledge compared with general inaccessibility to food. Based on these results, childcare health knowledge should be disseminated concurrently with working to improve food security within the community, which has the potential to improve health outcomes for infants.

Table 2: Duration that crops will last a family compared with average WHZ score of infants

Duration crops will feed family	Average WHZ score
I don't grow crops	-2.45
1-2 months	-1.78
3-5 months	-1.45
6-8 months	-1.33
12 months or more	-1.47

### ***Gestational Health***

Participating mothers were asked questions around their health behaviors during the gestational period. Some responses were compared to the results of the *Kalikot Maternal Health and Family Planning Report*<sup>6</sup> conducted in the district in 2016. In this questionnaire, 89% of women surveyed reported attending at least four Antenatal Care (ANC) visits during their last pregnancy, in which expecting women visit healthcare professionals for medical advice prior to giving birth. This number is dramatically higher than that found in 2016, at only 55%. The World Health Organization recommends that mothers attend a minimum of four ANC visits during pregnancy, as health workers are given a platform to disseminate information concerning gestational health practices and early infant care<sup>7</sup>. The infants of the mothers who reported attending four ANC visits showed better health outcomes than mothers who attended less than four, with an average WHZ score of -1.52. Those who reported attending just one had an average of -2.47 (n = 1). Every mother surveyed reported attending at least one visit. This could indicate that more women are attending ANC visits now than in 2016 – a positive trend – though it should also be noted that the 2016 report covered the entire district (a larger geographic area than this study’s focus).

During these visits, 96% of women reported being weighed to check for adequate weight gain during the gestational period. 60% of mothers did not report any changes to their dietary habits during pregnancy, while 21% ate less than usual, and 19% ate more than usual. The prevalence of eating less during the gestational period could be attributed to nausea experienced during pregnancy. The eating habits of mothers were examined from a caloric basis rather than specific diet, considering access to food variety is very limited in this region. These

<sup>6</sup> [2016 Kalikot Maternal Health and Family Planning Report](#)

<sup>7</sup> World Health Organization (WHO). WHO Recommendations on Antenatal Care for a Positive Pregnancy Experience: Summary: World Health Organization; 2018

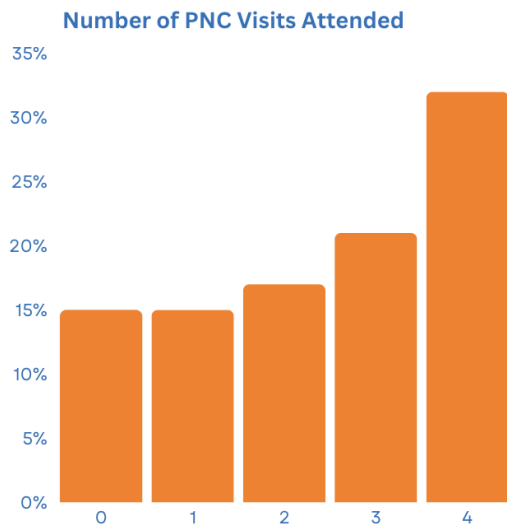
habits did not prove significant when related to infant health status for both WHZ and LAZ scores. Additionally, the majority of mothers interviewed were pregnant for the full gestation period of 9 months (94%), gave birth at an institution (96%), and had a normal vaginal delivery (91%). Of the two participants who had a home birth instead, the reported reason was that “The birthing center was too far.” Compared with the study conducted in 2016, the percentage of women having institutional births is substantially higher. In 2016, the percentage of women who reported home births in the past five years was 50.2%. This study was conducted before the construction of the Oda Foundation’s Birthing Center, and as such, it is probable that by simply having easier access to a birthing institution, more women are taking advantage of this service.

Postnatal Care (PNC) visits - the healthcare visits after birth - were not nearly as well attended as ANC visits, with just 32% of survey participants reporting having attended the full four visits as recommended by the World Health Organization<sup>8</sup>. 15% of respondents did not attend a single PNC visit, with the most common responses (57%) being that it “Didn’t seem necessary,” followed by “Distance to clinic.” Those that attended four PNC visits had the highest average WHZ score among their infants at -1.12. PNC visits are especially important so that healthcare professionals may track whether the care practices that women learned prior to giving birth are actually being practiced. PNC visits are also used to directly check on the wellbeing of the infant during the critical postnatal period. These findings indicate that there is an opportunity to improve the attendance of PNC visits as a potential pathway to improve infant health outcomes. This could include increased educational awareness about PNC visits and their importance as well as further exploring (and resolving) the barriers that may limit PNC visit attendance.

---

<sup>8</sup> WHO recommendations on postnatal care of the mother and newborn

Figure 4: Total Postnatal Care Visits attended



The mode distance that participants walked to reach the nearest health clinic was less than 30 minutes, with a corresponding average WHZ score of -1.51. These averages dropped as the distance became further, with 1 hour at -1.73, and 2-3 hours at -2.69. It is likely that mothers who live further from health outposts are less inclined to seek medical attention unless the situation is more dire, than those who have just a 30-minute transit time or less, hence the poorer health outcomes reflected in their infants. As seen in *Table 3*, of the women who lived less than 30 minutes from the nearest clinic, 35.7% attended all four PNC visits recommended, comprising the only demographic that did.

Table 3: Percentage of PNC visits attended based on distance to nearest clinic

Distance to Clinic	4	3	2	1	0
< 30 min	35.70%	21.40%	14.30%	14.30%	14.30%
1 hour	0%	25%	50%	25%	0%
2-3 hours	0%	0%	0%	0%	100%

Women were asked where they slept in the days immediately following birth, to examine the existing prevalence of *chhaupadi*<sup>9</sup>, as women are restricted from entering the house both during menstruation and immediately postpartum. This question was asked as either “Houserom,” “Cowshed”, or “Other.” 98% reported sleeping in a house room, with just one

<sup>9</sup> *Chhaupadi* is defined as a form of menstrual taboo which prohibits women and girls from engaging in daily activities while menstruating and immediately postpartum. Practices vary, but may include women being exiled to sheds or separate rooms, not being allowed to participate in celebrations, restricting certain foods, prohibition from the kitchen and from crossing bridges.

participant reporting sleeping in a cowshed. Houseroom was not further specified since this question was asked strictly from a sanitary viewpoint for the infant and mother, the possibility exists that women are still practicing *chhaupadi* in a different capacity than before by sleeping in separate rooms within the house. Generally, it may be assumed that the prevalence of *chhaupadi* is on the decline, as per the 2016 Kalikot Maternal Health and Family Planning Report, 61.7% of mothers who gave birth in the past five years slept in an animal shed outside of their homes with their newborn infants for an average of 12.5 days after they gave birth. Thus, the prevalence of practicing *chhaupadi* after giving birth has decreased by 59.7% between the two studies.

### ***Infant Feeding***

The age demographic of 6 months to 24 months was selected for this study because it is a critical period in an infant's life in which they are introduced to complementary feeding. The World Health Organization offers guidance that, for optimal health, infants should exclusively breastfeed for the first six months of life, after which water and food may be introduced. For proper complementary feeding, the World Health Organization recommends that infants receive complementary foods starting at 6 months old, being fed 2-3 times between the ages of 6-8 months, which can then be increased to 3-4 times per day between 9-24 months<sup>10</sup>. If this is followed, the infant is considered to have met Minimum Feeding Frequency (MFF). To meet another parameter of Minimum Acceptable Diet (MAD), infants must also meet Minimum Dietary Diversity (MDD), by consuming at least five of eight food groups on a given day. The following section examines to what extent these recommendations are being met by mothers in the municipality.

### ***Breastfeeding Practices***

Keeping in mind that the majority of these mothers had their last birth at an institution, following birth, 87% of them breastfed their infant within one hour of birth. 4% of participants waited until after a day had passed to first breastfeed their infants. While the majority are breastfeeding within the preferred window, since most of these births are happening in an institution with the support of a healthcare worker, there is opportunity to increase that percentage by having health professionals encourage mothers to breastfeed within the first hour

---

<sup>10</sup> World Health Organization, World Health Organization. Complementary Feeding.

of giving birth. 96% of mothers fed colostrum to their infants. Colostrum is the first form of breastmilk that is produced after giving birth, imperative to help build a newborn's immune system because of its high antibody and antioxidant content. 98% of mothers were still breastfeeding at the time of the interview. The average age of infants measured was 13.4 months, suggesting that mothers continue to breastfeed for a longer duration in this municipality. This is ideal, particularly in low resource settings, as breastmilk can provide additional nutrients and calories that may be difficult to access otherwise.

Survey participants were asked how many times they breastfeed per day. 59% reported feeding on demand, with 17% and 13% breastfeeding 1-4 times per day and 5-8 times per day, respectively. The infant health outcomes dependent on breastfeeding frequency were not significant for WHZ or LAZ scores; however, breastfeeding on demand is recommended by the World Health Organization<sup>11</sup>. Breastfeeding on demand was not reported in high numbers, which may indicate that there is an opportunity to improve education around its health benefits.

About 17% of mothers reported having difficulties breastfeeding their infants in this survey. In the municipality, there are limited alternatives to breastmilk in the event that a mother is unable to breastfeed her infant. Of the mothers that reported having difficulties breastfeeding, when prompted on what was fed to the infant instead, 62.5% of these mothers fed another type of milk (n = 5), 25% reported feeding "Other" (n = 2), found to be semi-solid food, and 12.5% (n = 1) did not feed anything else at all. These findings present an opportunity for the Oda Foundation to offer support by possibly exploring breastfeeding counseling services for mothers who are struggling with feeding their infants. Considering that the World Health Organization recommends that unmodified cow or goat milk should never be fed to infants as a replacement for breastmilk, providing infant formula is another possibility. Studies have found that this sometimes creates sanitary problems with sterilizing the bottle used, particularly in resource-constrained settings, so this method should only be used as a last resort to ensure the infant is still being nourished, and should be done with caution, supervision, and educational guidance. Struggles with breastfeeding are prevalent throughout the world – mothers only need appropriate resources to bridge this potential gap in health outcomes.

---

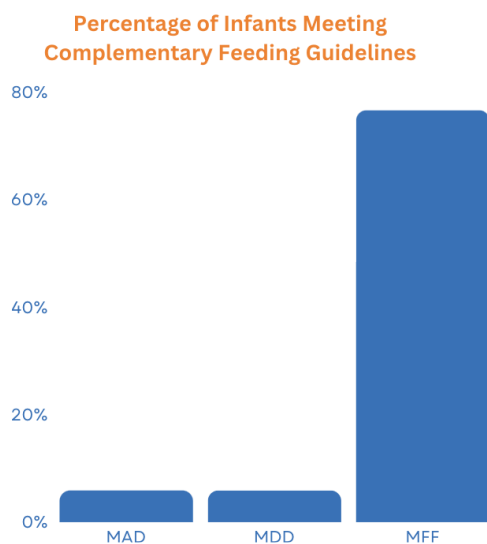
<sup>11</sup> World Health Organization. Breastfeeding Recommendations.

### Complementary Feeding Practices

Most of the mothers surveyed met the recommendation of waiting until 6 months of age to introduce food or water besides breastmilk to their infants, with 85% reporting either at or after 6 months of age. There are limitations to this question considering there is also a possibility that mothers are waiting for too long to introduce complementary feeding to their infants when breast milk alone is no longer sufficient to meet dietary needs. However, this study did not adequately distinguish this. This leaves 15% of mothers who did not meet the appropriate timeline for the introduction of complementary feeding, and reveals a gap in knowledge to be addressed to improve the percentage of mothers who are meeting this guideline.

Infant feeding practices were examined using MFF, MDD, and MAD. The percentage of participants who met these criteria were very low, as would be expected in such a low resource setting as a municipality within Kalikot. Just 5.9% of infants met MDD, while MFF fared much better with 76.6% of infants meeting the requirements. As both MDD and MFF need to be satisfied for MAD to be met, again, only 5.9% of infants met these stipulations. This is substantially lower than the national average meeting the requirements of consuming 5 out of 8 different food groups per day for ages 6-24 months for MDD. The national average in 2022, was found to be 78%.<sup>12</sup> As minimum feeding frequency was commonly met as opposed to minimum dietary diversity, it is clear that access to diverse foods in the area is a severe restriction for infant health, and a large barrier to surmount.

Figure 5: Percentage of infants meeting minimum acceptable complementary feeding stipulations



<sup>12</sup> Ministry of Health and Population, Nepal; New ERA; and ICF. 2022. *Nepal Demographic and Health Survey 2022: Key Indicators Report*. Kathmandu, Nepal: Ministry of Health and Population, Nepal.



## ***Infant Health***

As malnutrition is a complex disease that co-exists and is perpetuated by the onset of additional diseases, infant's general health was investigated, in addition to their history with other illnesses. 100% of the mothers surveyed reported that their infants had received all immunizations. This verifies that Mahabai Community Hospital has been very effective in their outreach for vaccinating children. Vaccination clinics are held once a month specifically for infants and have proven successful for this demographic. Of course, it must be considered that the population that makes up this survey are women who are already demonstrating health-seeking behavior, are first-time parents, and who live within 30 minutes of the clinic. It is very possible another demographic is being missed with this survey, and appropriate follow-up research should try to reach this more vulnerable demographic.

To examine general sanitary practices surrounding infant waste, mothers were asked what action they take to dispose of their infant's stool. The World Health Organization recommends that infant stool is disposed of either in the toilet or buried<sup>13</sup>. In this survey, 76.6% of participants reported disposing of their child's waste in the toilet, and 6.4% burying their children's waste.

The survey also explored past diseases that the infants had already suffered from, in order to better understand potential relationships with malnutrition. The diseases most associated with malnutrition are diarrhea and respiratory infections. Per this survey, 70.2% of infants had already suffered from coughing and/or rapid breathing, followed by 23.4% suffering from diarrhea. Interestingly, just 4.2% of these infants had been diagnosed with malnutrition, while this research shows that 46.8% of these infants suffered from wasting, stunting, or both. This demonstrates a considerable gap between those being diagnosed and treated for malnutrition compared with those whose malnutrition is going undetected. To catch more cases in the future and apply early intervention to mitigate the damage that malnutrition does to the body in a period of such critical development, the health team should concentrate on screening all children under 5 years coming into the clinic by taking all necessary measurements, and not just weight measurements as is happening now.

Of the mothers interviewed, 25.5% had lost a child under the age of 5 years in the past. Similarly, the 2016 Kalikot Maternal Health and Family Planning Report recorded 20% of women having at least one child die before the age of 5 years. These same women's infants also

---

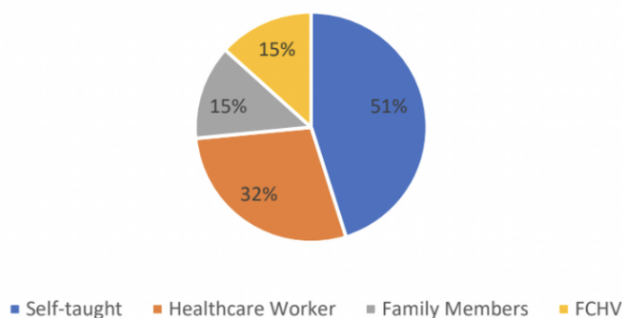
<sup>13</sup> WHO, UNICEF: Core Questions on Drinking-Water and Sanitation for Household Surveys. Geneva: World Health Organization and UNICEF; 2006.

had lower average WHZ scores than those women who had not previously lost a child, at -2.02, compared with -1.32. The national under-5 mortality rate in Nepal is 33 deaths per 1,000 live births<sup>14</sup>. This is a high rate of infant mortality for the area, especially considering that this is what has been found among women who already have shown health-seeking behavior. For further information on what specifically the high infant mortality rate may be stemming from, additional research should be conducted to deduce the exact affliction the infant died from, as well as their age, socioeconomic status, sociodemographic information, etc.

Mothers were asked from whom they received their education on childcare. There is a bit of ambiguity within this question, as to the mother’s interpretation of what childcare means, whether it is regarding feeding practices, health care, or general child rearing. Participants were allowed to select more than one source from whom they learned childcare. 51% of respondents reported that they were self-taught. Despite high numbers of these women attending at least four ANC visits, just 32% credited Healthcare Workers for their childcare education. 27.7% responded that they had learned from family members, and just 14.9% from FCHV’s (Female Community Health Volunteers). These results could indicate that the government-implemented Female Community Health Programme is seeing some limitations in this municipality with their outreach, and that Healthcare Workers at the Mahabai Community Hospital could additionally be ramping up efforts to be a presence of health information from the area. The results could also indicate that there isn’t a shared understanding of ‘childcare’ and that many women don’t currently view the information and education provided by healthcare workers as informing childcare, rather than healthcare.

Figure 6: From whom mothers reported receiving education on childcare

**From whom did mothers receive knowledge on childcare?**



<sup>14</sup> Ministry of Health and Population, Nepal; New ERA; and ICF. 2022. *Nepal Demographic and Health Survey 2022: Key Indicators Report*. Kathmandu, Nepal: Ministry of Health and Population, Nepal

The study also collected infants' birth weights, with 53.2% of participants falling between 2,500 and 3,500 grams at birth. 10.6% fell below the 2,500-gram margin at birth. However, no significant relationship was found between the birth weight of the infant, and their current nutritional status. The birth order of the infant was considered as another factor that may be associated with poorer health outcomes. The majority of the infants in this survey were the first born (44.7%). There was a pattern found among average WHZ scores for infants depending on their birth order, the averages generally lowering the higher in the birth order the infant was. The average WHZ score for the firstborn was -1.26, for second -1.68, for third -1.89, for fourth -1.10, and for fifth or higher -2.19. For LAZ scores, this same pattern was observed, but with less significant values. It's probable that this is observed because of resources being increasingly limited with each additional child in a family. For families who do not want to continue to have children, whether due to resource limitations or other reasons, access to family planning counseling and products should be incorporated into ANC and PNC visits.

### ***Conclusion and Recommendations***

In the past decade, the government of Nepal has made substantial progress in reducing the incidence of child malnutrition throughout its rural municipalities, though in these remote regions, combating child malnutrition remains a formidable challenge. Despite initiatives taken by the government to reduce the incidence of child malnutrition, its prevalence in the country remains high, especially in the remote areas of the country, such as the Kalikot district, where access to roads and basic healthcare remain an obstacle for the betterment of both maternal and infant health.

The results of this survey demonstrate that child malnutrition is a largely prevalent issue that needs to be addressed in the Mahabai 2 Municipality. There are several ways in which the Oda Foundation and the Mahabai Community Hospital may contribute to the alleviation of the incidence of malnutrition in the community. Infant health outcomes are, of course, a complex issue, and although it remains a challenge to isolate a single magic bullet for the eradication of child malnutrition, improving maternal health and childcare education proves to be an essential starting point.

Preventative medicine and causative medicine do not exist in a vacuum. While the solution to reducing child malnutrition lies in preventative programs, the existing cases of malnutrition found among infants should not be discarded. The Mahabai Community

Hospital may be able to catch more cases of child malnutrition and implement early intervention simply by routinely performing malnutrition screening for children under-5 coming into the clinic. MUAC measurements should be taken at the minimum, though ideally height and weight would also be recorded to properly deduce WHZ and LAZ scores to identify both wasting and stunting, and to further monitor the situation. By regularly screening for malnutrition, the clinic has the capability to treat malnutrition in its early stages, shielding infants from an additional onslaught of diseases in an already weakened immune state, and preventing them from suffering irreversible side-effects from malnutrition once they surpass the age of five years.

However, this practice is still limited in its outreach to those already seeking out healthcare in the community. The Family MUAC approach [developed](#) by ALIMA (the Alliance for International Medical Action) could help bridge this gap in the community<sup>15</sup>. The Family MUAC approach (also known as “MUAC for Mothers”) moves the task of taking MUAC measurements to mothers or other family members caring for the child. By providing families with MUAC tape and briefly training them on how to take measurements and read MUAC tape – an accessible tool regardless of education or literacy levels, earlier detection of cases is possible. Mothers will additionally be encouraged to bring their infants to the clinic on the basis of malnutrition alone, whereas otherwise they might not until the malnutrition is present concurrently with another disease. This initiative has proven successful in many regions over the world<sup>16</sup> and is lauded for cutting out the dependency on a healthcare worker to screen for malnutrition, especially important for women who must travel long distances just to reach a health outpost. As discussed earlier, MUAC will not detect every case of wasting as reliably as using WHZ and is not used as a measure of stunting. Thus, the clinic should still emphasize taking these measurements themselves concurrently with his program, in the event that it is implemented.

The problem persists in addressing the deficiency of proper feeding practices for infants that could alleviate the incidence of child malnutrition in the first place. The Oda Foundation may be able to recommend diversifying crops grown to improve food variety for both children and mothers’ diets, as well as emphasize the importance of eating animal products that provide

---

<sup>15</sup> The Family MUAC Approach

<sup>16</sup> Blackwell N, Myatt M, Allafort-Duverger T, Balogoun A, Ibrahim A, Briend A. Mothers Understand And Can do it (MUAC): a comparison of mothers and community health workers determining mid-upper arm circumference in 103 children aged from 6 months to 5 years. Arch Public Health. 2015 May 18;73(1):26. doi: 10.1186/s13690-015-0074-z. PMID: 25992287; PMCID: PMC4436117.

many nutrients that are often lacking in low resource settings (most notably zinc and iron) rather than selling these products for revenue. To improve community education regarding complementary feeding practices, Mother Support Groups (MSG's) may be worth exploring. A study in Kenya conducted by Undlien et al., demonstrated that infants with mothers who participated in MSG's had significantly better nutritional statuses than those whose mothers did not (Undlien, 2016)<sup>17</sup>.

MSG's [entail](#) groups of women who are either pregnant or have children under the age of 5 years having regular meetings in which education concerning infant and young child feeding (ICYF) is disseminated and open discussion is encouraged<sup>18</sup>. This may also be a platform for breastfeeding counseling, and further family planning consultation, as this research has demonstrated that many women in the community could benefit from additional education concerning these topics. This program could be facilitated by the Oda Foundation, considering that the organization has personnel trained specifically on ICYF and has the community space to hold such meetings. It additionally could be done in collaboration with FCHVs who also have received education on proper child feeding practices and who may have limited outreach on their own. While there are many multifaceted barriers that restrict the ease of reducing instances of child malnutrition at large, it remains possible that, even in low-resource settings, infants may have healthy outcomes should the resources be funneled into the right direction.

---

<sup>17</sup> Undlien, M., Viervoll, H. A., & Rostad, B. (2016). Effect of mother support groups on nutritional status in children under two years of age in Laisamis village, Kenya. *African health sciences*, 16(4), 904–909. <https://doi.org/10.4314/ahs.v16i4.4>

<sup>18</sup> World Health Organization. The role of mother's support groups.