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A National Survey on Care of Possible Serious Bacterial Infection among Sick Young Infants 0-2 Months in Private Sector Medicine Shops and Clinics in Nepal

Survey Report

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The Maternal and Child Survival Program (MCSP) is a global, $560 million, 5-year cooperative agreement funded by the United States Agency for International Development (USAID) to introduce and support scale-up of high-impact health interventions among USAID's 25 maternal and child health priority countries,* as well as other countries. The Program is focused on ensuring that all women, newborns and children most in need have equitable access to quality health care services to save lives. MCSP supports programming in maternal, newborn and child health, immunization, family planning and reproductive health, nutrition, health systems strengthening, water/sanitation/hygiene, malaria, prevention of mother-to-child transmission of HIV, and pediatric HIV care and treatment.

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Acronym List

ARI	acute respiratory infection
CAPI	computer-assisted personal interview
CBNCP	Community-Based Newborn Care Program
CHD	Child Health Division
CIMS	Current Index Medical Specialties
CMA	certified medical assistant
DDA	Department of Drug Administration
DHS	Demographic and Health Survey
DPHO	District Public Health Office
GPS	global positioning system
HA	health assistant
IMCI	integrated management of childhood illness
IMNCI	integrated management of neonatal and childhood illness
MCSP	Maternal and Child Survival Program
MOHP	Ministry of Health and Population
NCDA	Nepal Chemist and Druggist Association
ORS	oral rehydration salts
PSBI	possible severe bacterial infection
SNL	Saving Newborn Lives
USAID	United States Agency for International Development

Executive summary

Background

Nepal has made significant progress in reducing child mortality from 153 per 1,000 live births in 1990 to 39 per 1,000 live births in 2016.[1] Despite this progress, the latest Demographic Health Survey (DHS) estimates indicate that neonatal mortality contributes to 54% of under-five mortality. Furthermore, one of the leading causes of newborn deaths in Nepal is neonatal infection (sepsis), which is preventable and treatable. Nepal's Every Newborn Action Plan (NeNAP) 2015 aspires to reduce newborn deaths to 18.9 per 1,000 live births by 2020 and to 10.9 per 1,000 live births by 2035[2]. To achieve these goals, improving the quality of infection management requires more attention, given the burden of newborn deaths resulting from possible severe bacterial infection (PSBI) in Nepal.

The private sector accounts for the largest proportion of childhood illness treated in Nepal. According to the 2016 DHS, 74% of caretakers who sought care for children under five years with acute respiratory infection went to the private sector, mostly to private pharmacies (34%) or private clinics (32%). A recent qualitative study that assessed care-seeking for sick newborns also found that private providers were the predominant source of care for newborns due to their proximity, flexible hours, and familiarity[3]. However, nationally representative data on the quality and appropriateness of care for sick young infants provided in the private sector are limited.

In 2016, Save the Children's Saving Newborn Lives (SNL) program supported the Child Health Division (CHD) of the Department of Health Services (DoHS) to carry out a situation analysis of the management of PSBI cases in medicine shops in six districts[4] of Nepal. The study identified several concerns related to quality of care (e.g., inaccurate and potentially dangerous weighing/dosing and use of steroids for treatment of sick young infants). However, it also revealed promising opportunities for improvements.

The United States Agency for International Development (USAID) in Nepal requested that the Maternal and Child Survival Program (MCSP) build on the SNL situation analysis and coordinate a large, nationally representative survey to provide a more definitive picture of the current provision of outpatient PSBI care for newborns in the private sector. The results serve as a baseline against which to track change in availability and quality of outpatient PSBI management in the private sector. Study partners included CHD/Ministry of Health and Population (MOHPP), USAID, New Era, and MCSP. The survey was conducted in a representative sample of 25 districts between June and July 2017. Private shops and clinics were oversampled in four districts[5] targeted for future piloting of an approach to improve quality of management of sick young infants in the private sector.

[1] Ministry of Health - MOHP/Nepal, New ERA/Nepal, and ICF. 2017. Nepal Demographic and Health Survey 2016. Kathmandu, Nepal: MOHP/Nepal, New ERA/Nepal, and ICF.
[2] http://www.healthynewbornnetwork.org/hnn-content/uploads/NENAP-final-low-resolution.pdf
[3] Lama TP, Khatry SK, Katz J, LeClerq SC, Mullany LC. Illness recognition, decision-making, and care-seeking for maternal and newborn complications: a qualitative study in Sarlahi District, Nepal. J Health Popul Nutr. 2017 Dec 21;36 (Suppl 1):45. doi: 10.1186/s41043-017-0123-z.
[4] Sankhuwasabha, Kathmandu, Dailekh, Morang, Rautahat and Kailali were the 6 districts covered by the SNL study.
[5] Kavre, Rupandehi, Gorkha and Chitwan were the 4 districts oversampled; MCSP has plans to conduct a small pilot in Kavre district with support from USAID to demonstrate proof of concept.

Survey Objectives

The survey aimed to document the appropriateness of care provided by private medicine shops and clinics for PSBI in sick young infants aged 0-2 months in Nepal. The specific objectives were: 1) to characterize the current practices of service providers in private medicine shops and clinics in the assessment, treatment, referral, and follow-up of sick young infants; 2) to compare these practices with nationally and globally recommended practices for management of sick young infants; and 3) to identify factors that influence service providers' practices that could be amenable to improvement efforts.

Survey Methodology and Sampling

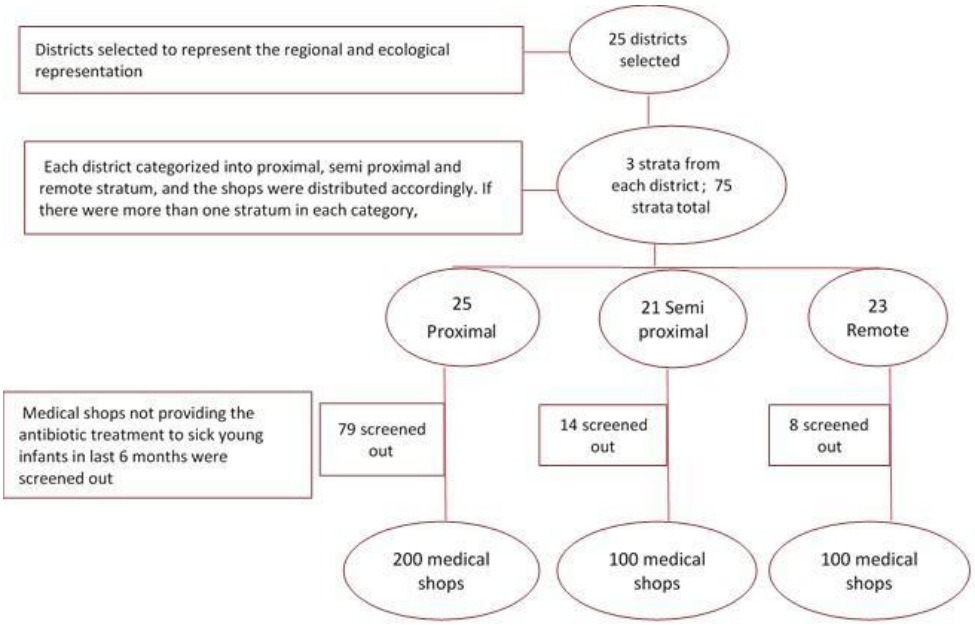
Multi-stage sampling was used to select medicine shops. In the first stage, 25 districts were purposively selected to ensure representation from each of Nepal's three geographical regions.[6] In the second stage, shops in each district were divided into three strata: proximal (within 30 minutes from a hospital[7]), semi proximal (30-60 minutes from a hospital[7]) and remote (>1 hour from a hospital[7]). Stratification was not emphasized for private clinics based on the discussion with stakeholders that most private clinics are located in proximal areas. If more than one stratum of the same category were identified, then the stratum was randomly selected. From each stratum, medicine shops were selected randomly. Within selected shops, the most experienced service providers were interviewed. In total, 400 medicine shops managing cases and providing antibiotics for sick young infants were targeted nationally, and an additional 196 shops in the four oversampled districts were selected initially for a pilot intervention to be implemented based on the survey findings. Those who consented to be interviewed (N=675) were asked about treatment practices related to Acute Respiratory Infection (ARI) and diarrhea. Afterwards, screening interviews were completed with the 675 medicine shops regardless of whether they provided treatment to sick young infants: 174 in the proposed pilot districts and 501 in the remaining districts were screened.[8] Among the 501, 400 shops were included and interviewed (200 proximal, 100 semi-proximal, 100 remote), while the remaining 101 medicine shops were screened out as they had not treated sick young infants in last 6 months. In the four proposed pilot districts where oversampling took place, 147 shops that treated sick young infants with antibiotics were included and interviewed (75 proximal, 39 semi-proximal, 33 remote). Weights have been applied in the analysis of medicine shops following the standard method to make it a nationally representative sample.

[6] Nepal's three geographical regions include *mountain* in the northern belt, *hill* south of the Himalaya, and *terai* in the southern belt.

[7] Any nearest hospital that provide inpatient care service to sick young infants

[8] All 675 shops screened responded to questions on case management of ARI and diarrhea in children 2-59 months.

Figure 1: Sampling Flow and Strategy for National Survey9



A total of 150 private clinics were targeted in the sample (no stratification within district). However, only 82 interviews were completed due to limited presence of clinics particularly in rural hill and mountain districts. A list of clinics was updated and randomly selected from each district without further stratifying.

Key Findings and Implications

Profile of private shops and clinics

- Physician-staffed clinics seeing sick young infants were concentrated in the more urban areas of a small number of districts. Eight districts had five or more physician-run clinics, all but one of them (Kavre) in the terai. *The limited availability of physician-run clinics in hill and mountain districts and in remote areas of terai districts reinforces the importance of ensuring peripheral and remote populations can access quality care at medicine shops.*
- Almost all medicine shops (95%) reported being open seven days/week; over three-quarters reported being open at least 11 hours/day. *This confirms findings of the six-district study and earlier care-seeking studies that this sub-sector provides easily available services, making them an important resource to the community and worthy of efforts to improve quality of care.*
- 45% of medicine shops in the study sample were not registered with the Department of Drug Administration (DDA); in peripheral/remote areas, the proportion was much higher (~75%). While reasons for a lack of registration were not captured in the study, the recent DDA regulation that requires medicine shops to have a qualified pharmacy technician may pose a strong barrier to registration, particularly for shops in rural areas where there are fewer pharmacists available.
- A high proportion of medicine shops were staffed by paramedics (84%): almost 70% by a certified medical assistant (CMA) or health assistant (HA), and 8% by a pharmacy assistant. 70% of paramedics had more than five years of experience (vs. 51% of the physicians). *These findings suggest that non-registered shops have equally qualified staff and provide quality care that is not inferior to that of registered shops. In addition, as medicine shops appear to be the main source of such service in peripheral and remote areas, they should be brought into the system and encouraged to register.*

[9] Clinics were not stratified as we did for medicine shops, thus not included in the figure

- Approximately 15% of medicine shop providers reported also working in public-sector health facilities. The percentage was higher among clinic physicians: 34% reported working in public-sector health facilities, and 33% reported working in other private-sector hospitals or clinics. *Findings confirm that dual practice is certainly present, especially for physicians, but most medicine shop providers are also not working in the public sector. This highlights the importance of ensuring these providers are kept informed of and are able to access current policies, guidance, and tools.*
- Participation in at least one training program—Integrated Management of Neonatal and Childhood Illness (IMNCI), Community-Based Newborn Care Program (CBNCP), or Community-Based Integrated Management of Childhood Illness (CBIMCI)—was reported by 27% of medicine shops and half of clinics. This shows there has been some IMNCI exposure within the private sector, and he six-district study shows that these providers consider the MoHP to be a highly credible source for clinical practice guidelines. *These findings suggest an opportunity for further engagement with the private sector.*

Assessment and treatment of sick young infants below the age of two months

- Most medicine shops reported providing services to sick young infants 0-2 months that involved more than just dispensing medicines; 86% reported also assessing and making treatment decisions. Non-physician providers based in medicine shops (mainly HAs and CMAs) may be playing a role that exceeds what they are formally permitted.
- Caseloads were variable, and the higher caseloads were concentrated among a relatively small number of providers. For example, although the mean number of young infants seen in the previous six months by medicine shops was 53, 56% of shops reported having seen fewer than 20 patients. The volume of sick young infants managed at outpatient level by clinics was about twice that of medicine shops (mean of 105 cases), and two-thirds treated 20 or more cases in the last six months. Therefore an efficient strategy aiming to reduce morbidity and mortality of sick young infants should concentrate particularly on outlets with higher volume of PSBI case .
- The volume of cases under one month old treated at medicine shops and clinics was considerably lower than for patients under two months. The average number of cases treated for under 1 month was 17 for medicine shops and 41 for the clinics whereas this was 53 cases and 105 cases for under 2 months infants for medicine shops and clinics respectively. This indicates that the majority of sick young infants seen in medicine shops and clinics were aged between four and eight weeks.
- While both private clinics and medicine shops reported use of reference materials for assessment, the pattern of use differed: private clinics were more likely to report use of IMNCI manuals (46% vs 16%), internet (28% vs 12%), and course books (49% vs 36%). Providers at both private clinics and medicine shops reported using Current Index Medical Specialties (CIMS) (28% and 37%, respectively). Medicine shops in remote clusters were least likely to report using IMNCI manuals, CIMS, or internet, and more than a quarter (28%) did not use any reference materials.
- In assessing sick young infants for classification and for severity of illness, 80-90% of providers at shops and clinics reported routinely checking temperature, respiratory rate, and breathing sounds. Compared to medicine shops, private clinics more commonly reported checking for feeding problems (65% vs 82%), jaundice (50% vs 70%), chest in-drawing (53% vs 60%), convulsion (24% vs 62%), level of consciousness (18% vs 46%), and umbilical infection (28% vs 47%). Making job-aids and other clinical assessment tools available to medicine shop providers along with proper training could be one of the contributing approaches to improve quality of assessment/classification.

- Treatments reported to have been given over the past six months for infants under two months with PSBI included oral antibiotics (99% of medicine shops and 94% of clinics), injectable antibiotics (20% of medicine shops and 46% of clinics), bronchodilators (43% for both medicine shops and clinics), and injectable steroids (11% of shops and 21% of clinics). The usual first-line oral antibiotic was reported to be amoxicillin by 62% of medicine shops and 65% of physicians. Cefixime was also commonly reported (35% of medicine shops and 39% of physicians). Drops were the most commonly used formulation of antibiotics for this age group (66% of medicine shops and 77% of physicians); oral suspensions were also used, but there was virtually no reported use of dispersible tablets. Shops and clinics generally provide amoxicillin as first-line treatment for infants 0-2 months as recommended, but efforts should be made to reinforce this practice to minimize use of other non-recommended treatments.
- Over the past six months 20% of medicine shops reported use of injectable antibiotics for treating sick young infants under two months. Such treatment was more commonly (46%) reported among physicians compared to the medicine shops. The sub-group of providers at medicine shops already treating sick young infants with injectable antibiotics should be prioritized to improve quality and timeliness of PSBI care in this sub-sector.
- Incorrect dosing was common for both oral and injectable antibiotics. This is a threat both with regard to treatment effectiveness and safety. Part of the problem was failure to base dose on weight—36% of medicine shops and 10% of physicians reported using age rather than weight.
- Even among those determining dose by weight, inaccurate weighing procedures were common, particularly in medicine shops. Most clinics (63%) reported using either a Salter or pan scale, although when doing so, 80% did not remove the baby's coverings to take the weight. Few medicine shops had Salter or pan scales available. Most (79%) reported determining weight by having the mother stand on an adult scale, with and without the baby, subtracting to determine the baby's weight. This inaccurate procedure was also commonly reported in clinics (37%). Among medicine shops, 11% reported just estimating the baby's weight by visual estimation. Accurate dosing, including proper weighing equipment and procedures, needs to be prioritized to help ensure treatment effectiveness and safety.
- About 20% of physicians and 11% of medicine shop practitioners reported ever using injectable steroids for treating sick young infants, most often "when the child has signs of critical illness." In almost all such cases, this is inappropriate and may increase the risk of death. This should be a priority area for MoHP, NePAS, and others to take action to address.
- Drug availability for treating sick young infants below two months was variable. Amoxicillin in syrup/suspension formulation was widely available in all ecological regions, whereas ampicillin in injectable form was available in less than a quarter of the medicine shops in each region. The most widely available injectable antibiotic was ceftriaxone (55%). Gentamicin (80mg/2cc) was available in 40% of medicine shops.

Referral and follow-up of sick young infants 0-2 months

- In general, both medicine shops and private clinics reported appropriate criteria for determining a need for hospital referral. Compared to medicine shops, more private clinics reported referral for low weight (<1500g), bulging fontanelle, central cyanosis, and failure to improve with treatment. Approximately half of both medicine shop providers and physicians reported routinely giving a pre-referral dose of oral antibiotics for such cases.
- Use of pre-referral injectable antibiotics was reported considerably low (8% of medicine shops, 12% of private clinics). Among the medicine shops, only 4.3% reported use of appropriate pre-referral antibiotics (gentamicin/ampicillin). Overall, none of the medicine shops performed all recommended pre-referral activities: identification of severe illness; facilitation of referral; and administration of appropriate pre-referral injectable. Nearly three-fourths of the medicine shops reported facilitating the referral process, which was higher among older providers than their younger counterparts. *Strengthening referral practices in the private sector, including with appropriate public or private sector facilities, should be a priority to improve overall quality of care, particularly for the most serious cases.*

- Appropriate follow-up practice consists of following up with non-referred sick young infants on the third and fifth days, providing appropriate advice to parents or guardians before starting the treatment, and following up with infants who have not returned for treatment as expected. About one-half of medicine shops said that they followed up with non-referred infants on the third and fifth days. Nearly one-third of the medicine shops provided adequate information to the parents/guardians regarding antibiotic use while starting the treatment. This was reported lower in the younger age group and among untrained IMNCI providers. Moreover, most medicine shop providers did not adhere to the practice of inquiring about infants who do not return for follow-up as expected. Overall, very few of the medicine shop providers (5%) practiced all appropriate measures of follow-up and counseling. *Approaches for improving follow-up of sick young infants under treatment in the private sector, particularly those who do not return for follow-up, should be developed and tested.*

Factors that influence provider practices in the management of sick young infants 0-2 months

The study assessed the influence of the following factors on provider practices: strata reflecting proximity to hospital (for shops only), provider age, medical qualifications, whether provider worked elsewhere, DDA registration status (shops only), and training in IMNCI/CBNCP. Further analysis will be needed in the future to better identify and analyze trends and implications.

- Strata: Providers in remote clusters were least likely to adhere to appropriate assessment practices but often offered appropriate injectable treatment services and were the most likely to offer appropriate oral antibiotic treatment services. These providers were the least likely to correctly identify signs for referral or to facilitate referral.
- Provider age: Providers over the age of 40 were the least likely to correctly identify indications for injectable antibiotics and the most likely to correctly use first line injectable antibiotics, but also the most likely to prescribe steroids. Conversely, providers under the age of 30 were the least likely to use IMNCI guidelines and the most likely to correctly identify indications for oral and injectable antibiotics, but the least likely to correctly follow most referral practices.
- Medical qualifications: Medicine shop providers with formal medical qualifications, compared to other medicine shop providers, usually performed better concerning assessment and treatment practices However, such providers were less likely to correctly identify the need for referral and to then facilitate during the referral, and they were less likely to appropriately meet all follow-up and counseling practices.
- Provider employment elsewhere: Providers that also worked at government or public facilities were overwhelmingly more likely to perform better than their counterparts. Whether or not a provider worked elsewhere largely did not have an influence on use of appropriate equipment for conducting assessments, correctly identifying the need for oral antibiotics, or whether or not appropriate follow up measures were taken.
- Registration status: Provider practices did not vary greatly among medicine shops registered with DDA and non-registered medicine shops.
- Training in IMNCI/CBNCP: Providers that received training in IMNCI/CBNCP were much more likely to follow appropriate assessment practices and to follow most practices related to giving injectable antibiotics. However, they were less likely to determine appropriate dose, frequency, and duration of injectable antibiotics, and were less likely to prescribe amoxicillin as a first-line oral antibiotic.

Treatment of diarrhea and ARI in young children:

- Most medicine shops were doing more than dispensing treatments for diarrhea, as 87% reported assessing and making treatment decisions. For oral rehydration salts (ORS) and zinc—as non-prescription drugs—this is within their legally permitted scope of practice.

- Zinc was available in about three-quarters of medicine shops in hill and terai districts but only 43% of shops in mountain districts. ORS was available in essentially all medicine shops in hill and terai districts, and in 88% of medicine shops in mountain districts. Similarly amoxicillin syrup/suspension was available in almost all shops and in dispersible tablet form in 74% of shops. Cotrim suspension or dispersible tablets were somewhat less widely available. Poor availability of zinc in private medicine shops in mountain districts, which could be attributed to the supply chain issues or lack of demand from medicine shops, needs to be further assessed and addressed.
- Overall, the likelihood of appropriate treatment for child diarrhea was slightly higher in physician-run clinics than in medicine shops. Among clinics, 98% reported prescribing ORS most or all of the time (vs 91% of medicine shops); 90% reported such use of zinc (vs 66% of medicine shops). Only 4% of physician-run clinics reported using antibiotics for most or all diarrhea cases (vs 6% of medicine shops). This suggests that in general service providers understand what constitutes proper diarrhea management. However, there remains room for improvement, particularly among medicine shop practitioners.
- When antibiotics were dispensed for non-bloody diarrhea cases, generally metronidazole was used. For bloody diarrhea, first-line treatments were cited as metronidazole (27% of medicine shops, 31% of clinics), fluoroquinolone antibiotics by about one-third of medicine shops (in line with IMNCI guidelines) and 16% of clinics, and cefotaxime by one-third (34%) of clinics. Usual care practices for antibiotic treatment of non-bloody and bloody diarrhea in the private sector are inappropriate. The MoHP, NePAS, and others should work with the pharmacological sector to ensure appropriate selection of antibiotics for first-line treatment of bloody diarrhea.
- For ARI, the overwhelming majority of medicine shops (86%) reported not just dispensing treatment but also assessing and making treatment decisions. Among peripheral and remotely located medicine shops, about 95% reported making treatment decisions. Note that since this entails use of antibiotics, this practice lies outside the formally recognized scope of practice for non-physicians working in the private sector. Nevertheless, as the main source of child ARI care in the country, the medicine shop sub-sector is serving a valuable social role. MoHP, NePAS, DDA, and others should find ways of more formally recognizing such practice and ensuring adherence to clinical guidelines.
- Virtually all providers reported using respiratory rate to classify ARI cases for treatment, in line with national protocols. Amoxicillin (with or without Clavulanic acid) was reported as first-line treatment by most providers in medicine shops (69%) and clinics (65%). Cefixime was the second most likely to be reported for use as first-line (18% of medicine shops, 12% of clinics). Overwhelmingly, providers reported using syrup/suspension formulations for treating young children (96%), not dispersible tablets. Since amoxicillin is the first-line treatment recommended under CB-IMNCI, it is good news to see this is the most commonly used treatment. Cefixime is not the recommended first-line drug but is also an efficacious treatment for ARI. Efforts could be made to improve access to dispersible formulations in the private sector.

Recommendations

A large proportion of private sector providers are caring for sick young infants, hence an urgent need for interventions aimed at improving quality of care in the private sector. The following recommendations are intended for a consortium of national-level partners from across the non-profit, government, and private sectors.

- **Undertake a multi-partner effort, leveraging corporate support, to increase the safety and quality of care for sick young infants by private providers.** The study identified several performance gaps that should be prioritized:
    - inaccurate weighing and dosing of sick young infants
    - potentially dangerous practices, particularly use of corticosteroids for treating sick young infants
    - limited use of pre-referral injectable antibiotics and referral facilitation acts

- **Carry out exploratory work to design and test sustainable and scalable strategies to enable and empower private providers to deliver quality care.** Strategies should avoid intensive training and expensive ongoing project inputs and instead employ a mix of light on-site coaching (perhaps modeled somewhat on private sector pharma detailing), at-a-distance support by phone, and job aids. Pre-service training of the paramedics could also be explored in collaboration with academic institutions. As practices were seen to differ between strata, approaches may need to be tailored to address specific needs of providers in remote areas as compared to needs in proximal or semi-proximal areas.

- **Promote access to and use of relevant clinical protocols.** As documented in the six-district study and found in this survey, medicine shop providers value clinical guidelines developed by the MOHP. The CHD can be a resource center by ensuring relevant clinical protocols are available on its website and encourage pharmaceutical companies and others to help publicize availability of national treatment protocols and other job aids.
- **Establish functional mechanisms to facilitate timely and reliable referral/coordination of care for more critically ill cases for care at hospital level.** Service providers at medicine shops and clinics play an important role to facilitate timely access to treatment at higher level facilities by calling the receiving institution and arranging transport, particularly for critically ill cases. Strategies to link private providers, particularly those in remote areas, with hospital-based physicians to access case-management advice should also be explored, through both traditional means and innovative technology, including digital/mobile technology.
- **Focus quality improvement efforts on high volume providers.** The volume of sick young infants managed by medicine shops and clinics was highly variable, with a small number of providers managing relatively large volumes. Concentrating initial quality improvement efforts on high-volume providers will contribute to greater impact.
- **Facilitate registration of medicine shops**. Around 45% of the medicine shops were unregistered under DDA, which makes it difficult to monitor their practices or include them in formal awareness or quality improvement initiatives. Collaborative efforts among CHD, DDA, NCDA and the public health offices or public health units at *Paalika level* is needed to design an approach that would facilitate registration of the medicine shops providing basic care to the community.

Conclusion

While half of clinics have trained providers, overall only a small proportion of medicine shops have providers trained on IMNCI protocol; therefore, many shop providers are managing sick young infants with limited knowledge and skills. Orientation of private sector providers on the national IMNCI guidelines could improve the existing service delivery. Considering that most medicine shops are providing treatment services to sick young infants, there is an urgent need for interventions aimed at improving quality of care in the private sector, and more emphasis should be placed on recognizing danger signs in young infants to ensure immediate referrals are facilitated at appropriate facilities. Engaging the pharmacological industry will be critical to ensuring sustainable logistics and supply chains that guarantee availability of appropriate drugs, supplies, and commodities to provide care to sick young infants.

1. Introduction

Newborn mortality accounts for more than half of all deaths among children under-five in Nepal (DHS, 2016)[10]. The Government of Nepal (GoN) has prioritized newborn health and developed and implemented various newborn policies, strategies and guidelines to reduce neonatal mortality. Major programmatic initiatives include the Community Based Integrated Management of Childhood Illness (CB IMCI), Community Based Neonatal Care Package (CBNCP) and Community based Integrated Management of Neonatal and Childhood Illness (CBIMNCI). While neonatal mortality has declined significantly, dropping from 39 per 1,000 live births in 2001 to 21 per 1,000 live births in 2016, further efforts are needed for Nepal to reach its Nepal Every Newborn Action Plan (NeNAP) goal of reducing neonatal mortality to 11 per 1,000 live births by 2035 (MOHP, 2016). Neonatal infections, which are preventable and treatable, are the leading cause of newborn deaths in Nepal. Effective treatment requires early identification of signs of infection and timely and appropriate care-seeking.

By and large, private sector health care providers such as medicine shops and private clinics are preferred over public health facilities as sources of treatment for sick children in Nepal. According to the 2016 DHS, 74% of caretakers who sought care for children under-five with acute respiratory infection (ARI) went to the private sector, mostly to private pharmacies (34%) or private clinics (32%). In the Multiple Indicator Cluster Survey (MICS) 2014, it was observed that about half of the children with ARI sought care from private providers, and the frequency of prescribing antibiotics was twice as great among private healthcare providers (67%) as compared to public healthcare providers (30%)11. Given the predominance of care being sought for sick young infants in the private sector, there is a need to understand and assess the quality of care being provided by the private sector in Nepal.

This study examined the appropriateness of care provided by private health care providers for sick young infants 0-2 months, particularly in the context of an unimpressive improvement in the neonatal mortality rate. The study also aimed to understand the care services provided by private care providers to manage diarrhea and ARI. This survey was conducted by New ERA, under the lead of Child Health Division, Nepal's Ministry of Health, with financial and technical support from USAID's Maternal Child Survival Program (MCSP) and Save the Children International (SCI).

1.1 Rationale

National level surveys indicate that private medicine shops, pharmacies and clinics were the major health service providers that are most frequently visited for the treatment of ARI and diarrhea among children under five years of age. In 2016, an exploratory study was conducted in Nepal to assess the public and private service providers' knowledge, attitudes and practices for treatment of PSBI among children less than six months of age[12]. Six districts were purposively selected representing mountain, hill and terai regions. Through stratified random sampling, 60 private and 24 public healthcare service sites were selected. Almost all private medicine shops reported treating PSBI in young infants, and about half reported having treated PSBI cases in infants <2 months over the past 3 months using injectable antibiotics. Meanwhile, only 3/24 public sector clinics reported having treated PSBI cases over that period. The study found that in medicine shops, the treatment given included a broader range of drugs and injectable steroids, than in public sector. It was also observed that private healthcare providers used a broad range of reference materials, as compared to public providers who reported using CB-IMCI and CB-IMNCI books as job aids. Finally, it was found that the private shops were providing service for more hours, thus making them a more convenient source of care compared to the public facilities.

[10] Ministry of Health - MOHP/Nepal, New ERA/Nepal, and ICF. 2017. Nepal Demographic and Health Survey 2016. Kathmandu, Nepal: MOHP/Nepal, New ERA/Nepal, and ICF.
[11] Central Bureau of Statistics, 2015. Nepal Multiple Indicator Cluster Survey 2014, Final Report. Kathmandu, Nepal: Central Bureau of Statistics and UNICEF Nepal.
[12] Saving Newborn Lives Program, Save the Children. A special study on provision of care for sick newborns in the private sector in Nepal.

Therefore, a nationally representative study was required to assess the management services provided by the private sector for sick young infant care and treatment across Nepal. Results received from this study will inform development of new program interventions at the national level. This survey is expected to provide a more definitive picture of the current practices among private medicine shops operated by non-physician care providers, as well as private clinics operated by physicians, regarding the management of PSBI among sick young infants 0-2 months, and can serve as baseline for tracking effects of an intervention to be developed and implemented in an upcoming pilot project.

1.2 Objectives

The survey was undertaken to document the appropriateness of care provided by private medicine shops and clinics for PSBI in sick young infants 0-2 months in Nepal. In addition, this survey aimed to understand the care practices of private providers in managing diarrhea and ARI among young children.

The specific objectives were:

- To characterize the current practices of service providers in private medicine shops and clinics in the assessment, treatment, referral, and follow-up of sick young infants;
- To see how these practices, compare with national and global recommended practices for management of sick young infants;
- To identify factors that influence the service provider's practices managing the sick young infants.
- To identify the practices of the private sectors in providing treatment services for ARI and diarrhea among children under five years of age.

2. Survey Methodology

2.1 Study Site Selection and Sample Size Determination

The study used a multi-stage sampling method to select private medicine shops for the national survey. Eligible districts with DDA-registered medicine shops comprised the sampling frame, and, in partnership with CHD, 25 districts across the country, representing geographical and development regions, were purposively selected from the frame. In the second stage, clusters in each of the 25 districts were selected randomly, followed by the selection of medicine shops at the next stage (Table 2.1). In the final stage, the service provider most often providing service at the shop was selected for an interview.

For the private clinics, the sampling frame was constructed in each of the 25 districts using the records from DHO and information from key informants.

Table 2.1: List of Districts for the Survey

Development Region	Terai (10)	Hill (10)	Mountain (5)
Eastern	Jhapa,Sunsari	Panchthar, Udaypur	Sankhuwasabha
Central	Chitwan*, Parsa, Rautahat, Mahottari, Dhanusha	Kavre*	Dolakha
Western	Rupandehi*	Myagdi, Syangja, Gorkha*	
Mid-Western	Banke	Salyan, Surkhet, Pyuthan	Mugu, Jumla
Far-Western	Kailali	Doti	Bajhang

** Denotes districts where the pilot was planned subsequently (Kavre, Rupandehi, Gorkha and Chitwan).*

The sample size needed to meet the desired level of significance and power and the details of the sampling processes are discussed below.

Sample Size Calculation for Medicine Shops

Given the lack of available baseline data, we assumed a value of 50%, 90% power, and 95% significance levels for the sample. Assuming a 2.0 design effect at the district level, we would require 384 medicine shops; adjusting for a 95% response rate, we would need to sample a minimum of 402. ~400 medicine shops treating sick young infant cases using antibiotics. The required sample size (n) of the medicine shops was calculated as follows:

- $n = Z^2 * PQ * D / E^2$ where,
- n = Required sample size of the registered medicine shops operated by non-physicians
- D = Design effect to account for multi-stage sampling = 2.0
- α = Desired level of significance = 0.05
- E = Desired level of power of the test = 0.90 (where $\beta = 0.10$ is the probability of type-II error)
- Z = z-score corresponding to desired level of significance = 1.96
- Substituting these values in the above formula; n = 384
- Adjusting for 95% response rate; n = 402 $\sim$ 400

Thus the survey was designed to cover a nationally representative sample size of 400 private medicine shops (16 per district) in 25 districts (Table 2.2). Furthermore, the survey aimed to oversample in four of these districts, referred to as pilot districts, for the purpose of future programming. These four districts included two districts each representing terai and hill areas. An additional 49 medicine shops were added for each of these four pilot districts (196 total) bringing the total sample size of medicine shops contributing information on treatment of PSBI in sick young infants to 596 (400 +196).

To capture the practices of private clinics, the survey aimed to sample 150 private clinics treating sick young infants 0-2 months old with antibiotics across the 25 study districts. Assuming 90% power, 95% significance levels, a 50% value at baseline, and an ability to detect 20% difference over time, we estimated that we would need a sample size of 124 private clinics. Assuming a design effect of 1.1 and a >90% response rate, we required approximately 150 clinics.

The sample was distributed based on anticipated numbers of clinics in each region: ten clinics from all terai districts (10x10=100) and four clinics from hill and mountain districts (15x4= 60). The oversampling of clinics in terai districts was intended to compensate for other districts in which the necessary sample of clinics may not be available, particularly in mountain regions.

Table 2.2: Summary of the Target Sample for the Study

Level	Sample Description	Target Sample Size
National Survey in 25 Districts	Non-physician providers operating DDA-registered medicine shops who report treating sick young infants with antibiotics	~400 (16 per district)
	Non-physician providers operating un-registered medicine shops who report treating sick young infants with antibiotics	
	Physicians operating private clinics registered with the DPHO who report treating sick young infants with antibiotics	~150
Pilot Study in 4 Districts (Sub-sample of the National Survey)	Non-physician providers operating DDA-registered medicine shops who report treating sick young infants with antibiotics	~260 (~65 per district)
	Non-physician providers operating unregistered medicine shops who report treating sick young infants with antibiotics	

Selection of Medicine Shops and Clinics

Selection of medicine shops

The survey team coordinated with the District Public Health Office (DPHO) in each study district to identify the number of hospitals providing in-patient service (public, private or others) for children in the district. Each district was stratified into three criteria based on the distance between the identified hospital and different rural/urban municipalities located in that district with best available transportation mode. The three strata were defined as follows:

- Proximal (within 30 minutes from the hospital),
- Semi-proximal (between 30 minutes and 1 hour from hospital), and
- Remote (>1 hour from hospital).

The required sample for medicine shops per district was divided between the three strata as follows:

- 25 national districts:
  - Mountain and hill: proximal-8, semi-proximal-4, remote-4 shops;
  - Terai: proximal-8, semi-proximal-5, remote-3 shops
- Additionally, in the 4 pilot districts:
  - Mountain and hill: proximal-25, semi-proximal-12, remote-12 shops
  - Terai: proximal-25, semi-proximal-14, remote-10 shops

Operational definitions for medicine shops and clinics for this survey was as follows:

Medicine Shops

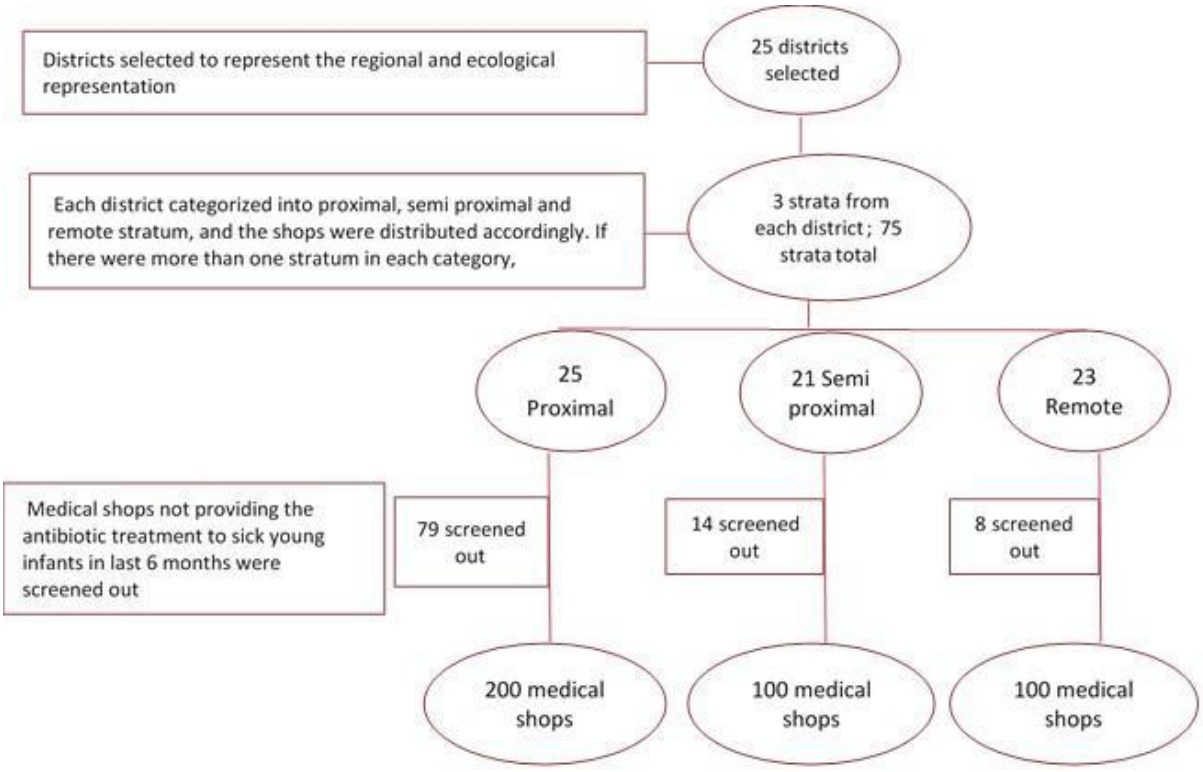
- Refers to private medicine shops that sell medicine with/without prescription,
- The service provider may or may not examine/treat patient, and
- Doctor is not the main service provider.

Clinics

- Refers to private clinics that may or may not be associated with a medicine shop,
- Doctor is the main service provider; or visits the clinic at least 4 days/week, and
- Doctor examines and treats patients.

Identification strata: Accessibility of newborn health services in terms of the time taken to reach service providers was considered to define strata in this survey. Each district presented unique characteristics with regards to its geographical location, number of hospitals providing infant care services, service accessibility, and number of medicine shops and clinics. The number of strata in the survey district, however, varied depending upon the number of hospitals and their service accessibility to the population. In some districts there is only one hospital that caters to the service needs of the district population. Therefore, from each district had only one stratum; each one from proximal, semi-proximal and remote category were selected. In those districts, that have more than one hospital providing infant care services, such districts may have more than one stratum depending upon the distance between the hospitals and the VDC/municipality that mostly access their services. In some districts, people also access services from hospitals in adjoining districts. The survey considered these hospitals as well to determine the segmentation of the stratum. Again, some districts did not have remote or semi-proximal strata as per the operational definition of strata for the survey. Therefore, some districts had only two strata and the sample of 16 medicine shops was divided equally (8 each) between them.

Figure 1: Sampling Flow and Strategy for National Survey



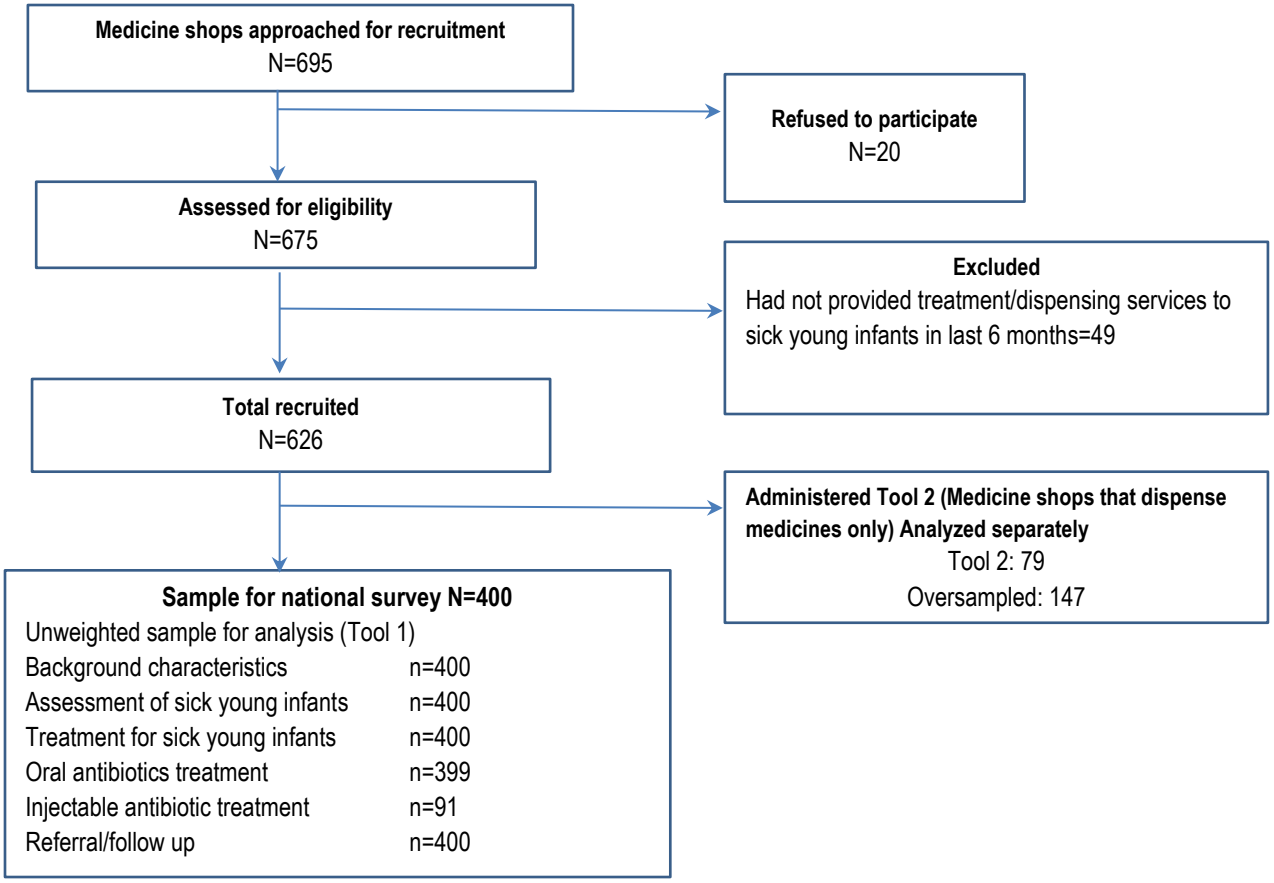
The survey team referenced the lists of medicine shops registered in the Department of Drug Administration (DDA) that was current as of April 2017, the Nepal Chemist and Druggist Association (NCDA), which was last updated in June 2016, and the Nepal Contraceptive Retail Sales (CRS), also current as of June 2016. The team coordinated with concerned DPHOs and local key informants to further update the list and to triangulate information obtained on the number of private medicine shops in different locations. Afterwards, one stratum of each category i.e. one each from remote, semi-proximal and proximal category were selected randomly in the presence of the DPHO and other stakeholders of the district. In some districts, due to the small number of medicine shops or unavailability of shops, an alternative cluster had to be selected within the survey districts. In this case, preference was given to another cluster from the same district, before then selecting from the nearest districts. They were then surveyed following the same process of random selection.

Identification of shops within clusters: Following the selection of the strata, the number and location of private medicine shops in different VDCs/municipalities was listed. In the first round, 8 medicine shops were randomly selected from proximal, 4-5 shops from semi-proximal, and 3-4 shops from remote clusters were selected and approached for the survey. If these medicine shops were found not treating or dispensing medicines to sick young infants 0-2 months of age, they were screened out of the survey. If they reported examining and treating infants, they were administered Tool 1, whereas if they only dispensed medicines, they were administered Tool 2. Medicine shops that treated infants 0-2 months in the past six months with antibiotics contributed to both the total samples in the national survey and in the pilot districts.

Screening the respondents: After the selection of the shops, the main service provider was identified. If there was more than one provider, then the provider who most frequently delivers services to sick young infants was selected for interview.

In some districts, the target sample of 16 shops could not be enrolled from the medicine shops randomly selected in the first round. This was due to several reasons, including medicine shops determined as ineligible, consent not given for interview, medicine shop closed or moved, or respondent not available (shops closed=8; shops not functional/not found=34). Re-sampling was necessary from the remaining medicine shops or the next cluster to meet the sample. In three districts, the team carried out a census of existing medicine shops to meet the required sample. Despite these efforts, in seven districts, the survey could not enroll the required sample, especially in the proximal sites. Thus, the national sample of 400 was met by taking replacements from similar clusters in other districts.

Figure 2: Recruitment of the medicine shops

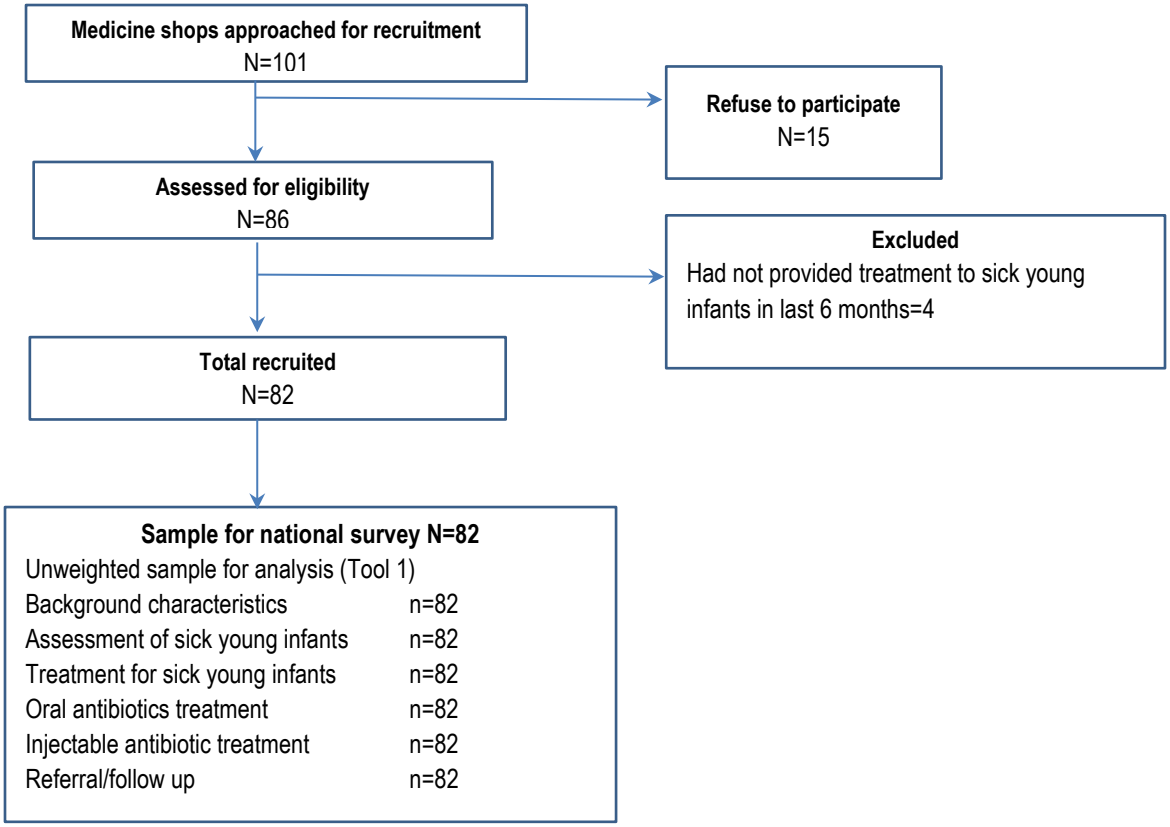


The same process of random cluster selection followed by selection of medicine shops was used in the four pilot districts. In cases where the same cluster was selected for drawing out the sample for both the pilot and national survey, the survey team first randomly selected samples for the survey. If enough medicine shops for the pilot survey remained, then the required number of shops were randomly selected. However, if the cluster did not have enough medicine shops, then all the remaining shops were interviewed, followed by shops from the adjoining cluster.

Selection of Private Clinics

For private clinics, the survey initially planned to divide the sample just between proximal and semi-proximal, as it was assumed that it would be difficult to find clinics in remote areas. However, during data collection, the team came across very few clinics in all clusters of each district and stratification of the sample was not feasible. A census of physician-operated private clinics was conducted in six of the districts, but the sample was still not adequate. As a result, attempts were made to replace the required sample from other sample districts. In total, the survey approached 101 clinics across the survey districts and completed interviews with 82 clinics run by a physician and providing treatment to infants 0-2 months with antibiotics.

Figure 3: Recruitment of the physician run clinics



2.2 Ethical Considerations

MCSP obtained approval for the study from the Western Institutional Review Board (WIRB) and Nepal Health Research Council (NHRC). At the time of initial contact with the service provider, following an informal introduction, a written consent form was administered to determine if the interview could be conducted. Data were collected on tablet PCs (Computer Assisted Personal Interview - CAPI) and every measure was taken to ensure privacy during the interview. All the tablets were password protected with only access to the core team members including the enumerators. Data were uploaded into the server after team supervisor had ensured for the completeness and accuracy. Once the data was uploaded into the server it was not in access to the data collection team. Data management officer was responsible for overall handling of the data. Data cleaning, coding and analysis were performed in a password protected computer with only access to the Data management officer and team leader. Data anonymization was ensured before starting the data analysis to maintain the data confidentiality. Furthermore, data management process respected the 'right to be forgotten' which implicates that database will only store those variables that are needed for the analysis and others will be deleted.

2.3 Data Collection Tools

Survey tools were prepared by MCSP with inputs from CHD and USAID, and necessary modifications were made by New ERA. A structured, pre-tested questionnaire in Nepali was used to interview the main service providers. There were two sets of questionnaires (available as a supplementary file).

Two separate questionnaires for service providers at medicine shops were used:

- Tool 1: Administered to service providers who had assessed and made decisions regarding antibiotic treatment of sick young infants 0-2 months in the past 6 months.
- Tool 2: Administered to service providers who only dispensed antibiotic treatments and were not involved in decision-making regarding the treatment of sick young infants 0-2 months in the past 6 months.

Tool 1 mainly included questions related to the practices of the service providers on assessment, treatment, referral, and follow up of sick young infants. Tool 2 focused on practices related to the dispensing of drugs. In addition to questions on the management of PSBI cases, the questionnaires for the service providers at clinics included questions regarding use of job aids, medicines, and other supplies/equipment and instruments. To map the location of the service providers, Global Positioning System (GPS) coordinates; longitudes and latitudes were also recorded through tablets. These coordinates were used to map the distribution of medicine shops and clinics across the survey districts.

Three sets of manuals – an interviewer's manual, CAPI manual, and GPS manual – were provided to each field researcher to guide the survey implementation, data checking, and transfer and obtaining GPS of each sample site.

2.4 Fieldwork Training and Data Collection

Survey Methodology Pretesting at Kavre

The survey team pretested the sampling methodology to determine the best method for listing, mapping, and sampling medicine shops and clinics. New ERA collected a list of medicine shops from DDA, NCDA, and CRS Nepal. The names of medicine shops were compiled across all lists and listed separately in terms of location. The team members then visited the district of Kavre, met and interacted with DPHO staff, medicine shop owners, and drug suppliers to complete the listing process. A list of private clinics operating in the district was also provided to the New ERA study team by DPHO, Kavre. It was determined that mapping of the medicine shops could be done best at DPHO. The learning from Kavre helped refine and improve survey methodology in other districts.

CAPI Programming Testing at Kathmandu

New ERA core team members also visited different medicine shops and clinics in Kathmandu to test CAPI Programming and tool consistency. Four medicine shops and three clinics were visited for program testing for two days in May 2017. Data were received at the New ERA server and the CAPI programmer checked the dataset received. Some changes to improve the skip patterns and flow of the questions were made in consultation with the team members.

Training

Following a stringent recruitment process, 15 people with clinical backgrounds/qualifications were selected to be trained to conduct the survey. The main training was conducted in Kathmandu from 1-9 June 2017 by New ERA with technical assistance from MCSP Nepal. During the training, the survey team was trained on paper questionnaires, followed by classes on tablet technicalities, and practice sessions. The interviewers carried out mock interviews, entered data into tablets, and learned how to check and deal with error/warning

messages. Role play demonstration sessions were conducted and participants were asked to enter data as per the responses provided. Their performances were assessed on an individual basis and feedback was provided to improve their skills.

Pretesting of Tools

After the completion of the training, the tools were pretested in Nuwakot. A total of 15 interviews took place; three with physicians, eight with medicine shops only dispensing antibiotics to sick young infants, and four with medicine shops treating sick young infants with antibiotics. All interviews were done in proximal areas due to time constraints. A review meeting was conducted to discuss findings from the pretest, and the tools were slightly revised.

Data Collection

A team of 15 data collectors divided into five groups to carry out data collection from June through July 2017. Interviews in medicine shops took about 40-45 minutes, while interviews in private clinics took about 30-40 minutes. At the end of each day, the data were reviewed and sent to the central office, and an additional back up was maintained in an SD card in the PC tablet. The data collection was carried out using ASUS T100TA tablets with Windows version 8.1. Data received at the central office were edited, verified, and cleaned. A computer program in CSPro version was set up to create backup files and transfer data to the server. The application was hosted in New ERA's server, which acted as the data collection platform. CSPro data were then extracted in to CSV files and exported to SPSS for analysis.

Quality Control and Supervision

The core team from New ERA, along with representatives from MCSP, USAID, and CHD visited various field sites and observed the interviews to monitor and maintain data quality. The teams were closely supervised and given feedback. The field researchers checked their data before sending them to the central office at the end of each day. Field-level editing was completed before the data reached the central office. The data sent by field researchers were received and reviewed thoroughly every day. In case of any confusion or doubt, interviewers revisited and re-interviewed the sample medicine shop or private clinic, before leaving the sample district. At the end of each week, field check tables were generated and based on the data received, feedback was provided to each team.

2.5 Data Analysis

Data received at the central office were edited, verified and cleaned, and only authorized persons had access to the dataset. Analysis for this survey was carried out using SPSS. An equal number of shops were sampled from each of the 25 districts for the national survey; therefore, weights have been applied in the analysis following the standard method to make it a nationally representative sample. To develop sample weights, first, the sampling probability (P) of each medicine shop pertaining to the sampling frame was computed. This was adjusted for the response rate (RR) within that frame. The raw weight (W) was then computed as W = P X RR. The raw weights were then standardized so that the sum of the standardized weights are equal to the overall sample size (number of medicine shops). Overall, this report presents – weighted analysis of 400 national sample of non-physician operated private medicine shops that assess and treat sick young infants 0-2 months, and unweighted analysis of 82 clinics that assess and treat sick young infants. It is important to note that data analysis of the oversampling in four districts was done separately and is not included in the national survey data.

Composite indices were developed to reflect the appropriateness of practice by providers on four aspects: assessment, treatment, referral, and follow up. Components of each of the index are shown in the table below. Each components were dichotomized; '0' for No and '1' for Yes. Then score for each of the components were summed up. For appropriate assessment, if the total sum was 4 then it was categorized as appropriate assessment and else were grouped under inappropriate assessment. Likewise, for Appropriate injectable antibiotic treatment, if the score was 5 then it was categorized as appropriate injectable treatment

else inappropriate. For appropriate oral antibiotic treatment, appropriate referral and appropriate follow up; a score of 3 was grouped under appropriate and else under inappropriate.

Indices	Components
Appropriate assessment	1. Cite at least 4 out of 10 correct signs of PSBI 2. Use of IMNCI guideline for assessment 3. Use appropriate equipment (timer/watch or stethoscope and thermometer) 4. Assess at least 4 out of 10 signs of severe illness as per IMNCI protocol
Appropriate injectable antibiotic treatment	1. Correct indication for injectable antibiotic (at least 4 signs) 2. Use of gentamicin/ampicillin as first line injectable antibiotic 3. No reported use of injectable steroids for PSBI cases 4. Correct weighing procedure 5. Correct determination of dose, frequency and duration
Appropriate oral antibiotic treatment	1. Correct indication for oral antibiotic (assess respiratory rate/use stethoscope) 2. Use of amoxicillin as first line injectable antibiotic 3. Correct determination of dose, frequency and duration for amoxicillin
Appropriate referral	1. Cite at least four signs of severe illness indicating referral 2. Referral facilitating acts (organizing transport, calling ahead to receiving facility, etc.) 3. Pre-referral administration of appropriate injectable antibiotics (Gentamicin/ampicillin)
Appropriate follow up	1. Follow up non-referred cases on at least Day 3 & 5 of treatment 2. Give appropriate advice to parents or guardians 3. Contact parents/care-takers of infants who do not return as expected

2.6 Limitations

Since respondents were requested to recall their care provision over the six months preceding interview, recall bias can be expected in some questions. In some districts, the samples were inadequate because of ineligibility, non-availability of respondents, and refusal to participate in the survey. In those cases, replacements were made as far as possible from the same cluster and district or from other geographically similar sample districts.

Physician operated medicine clinics could not be found in most of the survey districts. An effort was made to replace them from other similar sample districts, but this was not possible for all cases. Therefore, the survey fell short of the total target sample of private clinics proposed for the study.

During the time of the survey, the Government was taking steps to identify unregistered medicine shops and clinics. As a result, some respondents were hesitant to participate in the survey.

3. Results from Private Medicine Shops and Clinics that Assess and Treat Sick Young Infants 0-2 Months

This chapter presents findings from the survey of 400 non-physician operated private medicine shops (weighted) and 82 physician-operated private clinics (unweighted) in 25 districts. The medicine shops were distributed across different strata and ecological zones. Ecologically, 67% of medicine shops were located in the terai region, while 4% were from five districts of the mountain region. Proximity-wise, as per the sampling design, 50% of the medicine shops were within 30 minutes distance from a hospital providing infant care. The remainder of the medicine shops were located more than 30 minutes from hospitals (Table 3.1A).

Table 3.1A: Distribution of Private Medicine Shops Sampled by Ecological Zone and Proximity to Hospital

	National	
	N	%
Ecological zone		
Mountain	15	3.8
Hill	118	29.5
Terai	267	66.7
Distance from hospital to medicine shop		
Proximal (0-30 minutes from hospital)	200	50.0
Semi-proximal (30-60 minutes from hospital)	100	25.0
Remote (More than 1 hour from hospital)	100	25.0
Total (N)	**400**	**100.0**

Seventy percent of the clinics were located in the terai region, while the rest were in the hill region (Table 3.1B). Most of the physician-operated private clinics (83%) did not have inpatient care services for sick young infants. About 13% of the clinics least MBBS doctor provided the service for 24 hours, and two-fifths of the clinics provided 11-15 hours service in a day (Table 3.1B).

Table 3.1B: Distribution of Private Clinics by Ecological Zone, Availability of Inpatient Care Service and Availability of Health Worker as Service Provider

	National	
	N	%
Ecological zone		
Mountain[13]	0	0.0
Hill	25	30.5
Terai	57	69.5
Provide inpatient care service for sick young infants		
Yes	14	17.1
No	68	82.9

[13] The survey team could not interview any service providers from clinics located in the mountain region due to lack of physician-run clinics.

	National	
	N	%
Availability of service per day		
1-5 hrs	17	20.7
6 - 10 hrs	20	24.3
11 -15 hrs	34	41.5
24 hrs	11	13.4
Total (N)	**82**	**100**

3.1. Background Characteristics of Private Medicine Shops and Clinics and Their Service Providers

3.1.1. Background Characteristics of Medicine Shops and Clinics

Just over half (55%) of the private medicine shops had DDA registration, while 37% were not registered anywhere. Some medicine shops (14%) were registered with NCDA (Table 3.2). A small number of medicine shops had more than one registration, mainly with both DDA and NCDA (7% unweighted), followed by those registered as a Sangini outlet and also registered with DDA and NCDA (2% unweighted) (data not shown in table). Most of the medicine shops in remote clusters were not registered (61%), followed by those in semi-proximal sites (54%), while in the proximal cluster, only 16% of medicine shops were unregistered. Few shops and clinics were open to provide services for 24 hours a day (15 medicine shops and 16 clinics). Instead, most shops and clinics provided service for 11-15 hours per day and operated throughout the week.

Table 3.2: Background Characteristics of Private Medicine Shops and Clinics by Registration Status, Availability of Physician and Operating Hours

Characteristics	Medicine shops				Clinics %
	Proximal	Semi-proximal	Remote	Total	
Registration Status					
Sangini Outlet	10.9	5.8	4.2	8.0	-
DDA	74.3	36.3	34.2	54.8	-
NCDA	19.1	6.9	8.6	13.5	-
Not Registered	16.4	54.4	61.1	37.0	-
Usual operating hours[3]					
1-5 hrs	1.0	0.0	1.0	0.8	1.5
6-10 hrs	5.2	12.5	2.0	6.2	16.7
11-15 hrs	92.3	84.4	96.9	91.5	80.3
>15 hrs	1.5	3.1	0.0	1.5	1.5
Total (N)	194	96	98	388	66
No. of days open per week					
1-2 days	0.0	0.0	0.0	0.0	2.4
3-5 days	1.6	1.6	3.9	2.2	2.4
6 days	0.5	2.7	6.4	2.5	12.2

Characteristics	Medicine shops				Clinics %
	Proximal	Semi-proximal	Remote	Total	
7 days	97.9	95.7	89.8	95.3	82.9
Availability of services per day in hours					
1-5 hrs	3.0	3.8	4.4	3.5	-
6-10 hrs	16.1	32.4	18.7	20.9	-
11-15 hrs	77.2	62.1	74.9	72.8	-
>15	3.7	1.6	2.0	2.8	-
Availability of another qualified health worker					
Yes	54.0	35.0	37.0	45.0	-
No	46.0	65.0	63.0	55.0	-
Total (N)	**200**	**100**	**100**	**400**	**82**

1 The denominators for this include medicine shops that had physician/s' visit scheduled for certain days in a week. The medicine shops that had physicians' visits scheduled on monthly basis are not shown in the Table because their numbers are very few.

2 Denotes the availability of physician per day. The denominators for this include medicine shops that had physician available throughout the week, and those that had physician/s' visit scheduled for certain days on either weekly or monthly basis.

3 15 medicine shops and 16 clinics operated for 24 hours.

No data or (-) in the Table indicate that these questions were not asked to clinics.

3.1.2 Background Characteristics of Service Providers in Private Medicine Shops and Private Clinics

The majority of service providers at the medicine shops and clinics were male (Table 3.3A and B). Over one-half of the medicine shops were run by Community Medicine Auxiliary (CMA) graduates. Some medicine shops were run by service providers who had attended some orientation programs run by health professionals.

Most service providers at private medicine shops were not trained in IMCI/IMNCI or CBNCP. More service providers in proximal sites had received training on IMCI/IMNCI than in semi-proximal and remote sites (Table 3.3A).

Table 3.3A: Background Characteristics of Service Providers in Private Medicine Shops

Characteristics	Medicine shops			
	Proximal	Semi-Proximal	Remote	Total
Sex				
Male	85.5	94.0	79.0	86.0
Female	14.5	6.0	21.0	14.0
Age				
<30 years	22.1	20.0	29.9	23.5
30 - 40 years	43.7	51.5	43.0	45.5

Characteristics	Medicine shops			
	Proximal	Semi-Proximal	Remote	Total
>40 years	34.3	28.5	27.2	31.0
Mean	38 (sd 10.8)			
Highest academic qualification for medical care				
Nurse	0.1	2.6	2.7	1.4
ANM	5.9	2.8	4.2	4.7
Pharmacy assistant	10.0	6.2	4.5	7.7
HA	18.2	17.5	10.2	16.0
CMA	47.2	56.7	62.0	53.3
VHW/MCHW	1.3	2.1	6.1	2.7
No academic qualification for medical care	17.2	12.1	10.3	14.2
Ever received training on IMCI/IMNCI				
Yes	32.5	23.0	20.0	27.0
No	67.5	77.0	80.0	73.0
Ever received training on CBNCP				
Yes	17.0	13.0	12.0	14.8
No	83.0	87.0	88.0	85.3
Total (N)	**200**	**100**	**100**	**400**

Among the private clinics, the survey only covered those operated by physicians. One-half of the service providers in clinics had MBBS degrees, while a little over one-third were pediatricians. Close to half of the physicians reported that they provided inpatient care for infants at other hospitals or medicine facilities they worked with, while 16% provided inpatient services for sick young infants at the sampled clinics. Fifty-one percent of the physicians providing services at the clinics had not received IMCI/IMNCI training (Table 3.3B).

Table 3.3B: Background Characteristics of Service Providers in Private Clinics

Characteristics	%
Sex	
Male	97.6
Female	2.4
Age	
<30 years	17.1
30 - 40 years	57.3
>40 years	25.6
Mean	38 (sd 9.2)
Highest Medical Qualification	
MBBS doctor	51.2
Pediatrician	37.8
General Practitioner	4.9
MD General Medicine	3.7

Characteristics	%
Others	2.4
Service provider role in inpatient care for sick young infants	
Provide inpatient care for infants at associated hospital	46.3
Provide inpatient care for sick young infants at this clinic	15.9
No role in providing inpatient care	36.6
Others	1.2
Ever received training on IMCI/IMNCI	
Yes	48.8
No	51.2
Total (N)	82

Around 62% of service providers in medicine shops have treated sick young infants for the past five or more years, whereas in private clinics this proportion was 51% (Table 3.4). An overwhelming majority (81%) of private providers at the medicine shops stated that they did not work elsewhere. In private clinics, those who reported working elsewhere mainly worked in a government health facility or hospital (34%) or in a private hospital (33%).

Table 3.4: Professional Experience of Service Providers at Private Medicine Shops and Clinics

Characteristics	Medicine Shops				Clinics
	Proximal	Semi-Proximal	Remote	Total	%
Years of experience in treating sick young infants					
< 1 year	0.3	0.2	0.6	0.3	4.9
1-<5 years	21.6	28.1	37.4	27.2	43.9
5-<10 years	25.2	37.8	18.6	26.7	20.7
10-<15 years	20.2	10.6	11.7	15.7	14.6
15+ years	32.8	23.3	31.6	30.1	15.9
Years of experience working in sampled medicine shops/clinic					
< 1 year	8.4	7.8	3.6	7.0	31.7
1-<2 years	12.2	15.6	26.8	16.7	28.0
2-<5 years	25.1	27.3	19.9	24.3	20.7
5-<10 years	19.0	31.4	18.6	22.0	9.8
10-15 years	9.6	8.5	18.9	11.6	6.1
>15 years	25.9	9.4	12.2	18.3	3.7
Service provider's employment at other facility					
Government health facility/hospital	12.6	17.0	19.0	15.3	34.1
Private health sector/hospital	0.8	3.0	2.1	1.8	32.9
Other government sector	0.0	0.4	0.0	0.0	4.9
Other non-health care private sector	1.0	1.9	0.9	1.5	4.9
Others	0.0	1.3	0.0	0.3	4.9

Characteristics	Medicine Shops				Clinics
	Proximal	Semi-Proximal	Remote	Total	%
Nowhere else	85.5	76.4	78.0	81.3	32.9
Total (N)	**200**	**100**	**100**	**400**	**82**

*Percentage may add up to more than 100 because of multiple responses

3.2 Assessment of sick young infants in private medicine shops and clinics

The service providers at medicine shops and clinics were asked about the usual actions taken to assess sick young infants. Counting the respiratory rate and taking the baby's temperature were the actions most commonly reported by providers in both shops and clinics, followed by use of the stethoscope to check breathing.

Stethoscope, thermometer, and respiratory rate timer/watch were the most common equipment/instruments used by service providers at medicine shops and clinics to assess sick young infants 0-2 months. Regarding the equipment they used for assessment, Pulse Oximeters were less commonly used by medicine shops (14%) compared to 70% of providers in clinics.

The most common reference material used for assessment/classification of sick infants in medicine shops was the Current Index Medicine Specialties (CIMS) (37%), followed by various course books (36%); while 25% reported not using any reference materials. In clinics, the most common reference materials used was course books (49%), followed by IMNCI guidelines (46%), and the Internet and CIMS (28% each).

When asked about signs that indicate PSBI in infants, nearly all providers at medicine shops reported high fever (89%), followed by fast breathing (86%) and chest in-drawing (82%). About 2% of service providers in medicine shops said they did not know which symptoms indicate PSBI (Table 3.5).

Table 3.5: Percentage distribution of Private Medicine shops and Clinics by types of Actions Taken to Assess Sick Young Infants ≤2 Months of Age

Actions for assessment	Medicine Shops				Clinics
	Proximal	Semi-proximal	Remote	Total	
Usual actions taken to assess sick young infants 0-2 months *					
Take temperature	91.4	79.9	90.2	88.3	89.0
Count respiratory rate	91.7	92.1	86.3	90.5	90.2
Check oxygen saturation	15.4	25.8	18.9	19.0	58.5
Listen to the patient's breathing	80.6	88.8	83.3	83.3	82.9
Weigh child	28.2	44.2	28.5	32.3	65.9
Ask caregiver about how infant is feeding	66.5	65.0	60.8	64.8	81.7
Ask caregiver about whether or not they have observed the baby convulsing	17.2	36.4	23.2	23.5	62.2
Assess child's movement/level of consciousness	13.5	21.3	22.6	17.8	46.3
Assess chest in-drawing	47.9	58.8	57.4	53.0	59.8
Assess if bulging fontanelle present	13.2	7.0	8.4	10.5	29.3
Confirm age of the infant by date of birth	10.0	10.8	13.7	11.3	22.0

Actions for assessment	Medicine Shops				Clinics
	Proximal	Semi-proximal	Remote	Total	
Listen for grunting	11.3	3.9	11.5	9.5	26.8
Check for skin pustules	39.5	32.7	38.2	37.5	46.3
Check for redness/pus in umbilical region	31.0	24.8	24.0	27.8	47.6
Jaundice	46.5	56.7	50.4	50.0	69.5
Diarrhea	4.6	1.2	0.0	2.5	3.7
Others	5.9	6.7	7.5	6.5	12.2
Use of specific equipment/ instruments to assess sick young infants 0-2 months*					
Respiratory rate timer/watch	78.0	86.5	73.7	79.0	84.1
Thermometer	97.4	100.0	97.3	98.0	98.8
Stethoscope	94.5	100.0	97.7	96.8	100.0
Pulse oximeter	19.2	10.8	6.5	14.0	69.5
Tongue depressor	22.9	10.7	7.1	16.0	30.5
Torch	8.9	17.5	9.0	11.1	20.7
Weighing scale	17.0	1.6	5.2	10.2	6.1
Others	5.0	3.5	0.0	3.5	2.4
No equipment used	0.0	0.0	2.2	0.5	0.0
Reference materials used for assessment/ classification of sick infants 0-2 months*					
IMNCI treatment guide	15.4	20.4	10.4	15.5	46.3
CIMS	43.4	38.1	23.3	37.0	28.0
MIMS	6.1	12.7	0.2	6.3	7.3
Course book	33.3	36.3	40.4	35.8	48.8
Internet	18.3	8.7	4.1	12.4	28.0
Medical and pharmacy books	3.3	3.5	5.6	3.9	0.0
Others	0.7	6.6	10.6	4.7	4.9
No reference materials used	25.0	21.6	27.6	24.8	11.0
Reported indication of PSBI among infants 0-2 months*					
High fever (>38.5 0c)	89.9	85.8	90.7	89.0	-
Abnormally low temperature (<35.50 C)	39.7	51.1	19.2	37.5	-
Severe chest in-drawing	86.5	82.3	72.0	81.8	-
Fast breathing	86.5	86.8	82.0	85.5	-
Poor/no feeding	32.4	22.4	27.9	28.8	-
Convulsions	20.5	20.9	16.7	19.5	-
No movement at all or only on stimulation	12.3	12.9	30.5	17.0	-
Unconscious	11.2	16.1	15.8	13.5	-
Bulging fontanelle	19.0	21.5	13.6	18.3	-
Nasal flaring	24.3	41.2	26.9	29.3	-
Dehydration	0.4	1.3	0.2	0.6	-

Actions for assessment	Medicine Shops				Clinics
	Proximal	Semi-proximal	Remote	Total	
Diarrhea	2.3	0.0	0.0	1.2	-
Skin infection	2.1	0.4	4.7	2.3	-
Other	8.6	12.1	6.6	9.0	-
Don't know	1.5	2.5	3.2	2.3	-
Total	**200**	**100**	**100**	**400**	**82**

* Multiple responses.

No data or (-) in the Table indicate that these questions were not asked to clinics.

The appropriateness of the assessment practices of service providers at medicine shops and clinics were assessed by their background characteristics (Table 3.6A & Table 3.6B). As Table 3.6A shows, only 10% of the providers at the medicine shops had appropriate assessment practices, though this figure is much higher among those trained on IMNCI and among those that work in government facilities. Among private clinics, 32% of physicians appropriately assessed the sick young infants. Physicians with only MBBS qualifications had lower reporting of appropriate assessment practices (17%) compared with pediatricians or those with a higher qualification than an MBBS (Table 3.6B).

Table 3.6A: Percentage distribution of medicine shops providing appropriate assessment to sick young infants by background characteristics in medicine shops

Background Characteristic	Correct indications of PSBI (at least 4)	Use IMNCI guideline	Use of Appropriate Equipment	Assess at least 4 severe signs as per WHO	Appropriate assessment practice	Total N
Age (years)						
>30	59.7	10.5	99.9	62.5	7.4	94
30-40	78.6	16.2	99.6	62.9	10.4	182
<40	72.5	17.8	94.2	72.6	11.4	124
Medical qualification						
Medical*	73.2	17.8	99.8	65.7	11.7	302
Non-medical	69.5	7.8	92.6	66.2	4.7	98
Work elsewhere						
Government HF	83.9	57.5	99.0	82.9	49.3	61
Other	69.1	9.4	100.0	55.2	7.2	13
Nowhere	70.2	7.7	97.8	63.1	2.7	325
Proximity						
Proximal	76.3	15.4	97.4	69.8	8.4	200
Semi Proximal	81.5	20.4	100.0	62.9	16.6	100
Remote	55.0	10.4	97.3	60.9	6.6	100
DDA Registration						
Yes	78.4	15.6	97.7	72.2	9.5	112
No	64.9	15.1	98.5	58.2	10.6	181

Background Characteristic	Correct indications of PSBI (at least 4)	Use IMNCI guideline	Use of Appropriate Equipment	Assess at least 4 severe signs as per WHO	Appropriate assessment practice	Total N
Trained on IMNCI/NCP						
Yes	78.9	40.0	99.4	88.7	31.1	112
No	69.7	5.8	97.5	57.0	1.8	288
Ecological region						
Mountain	46.0	25.8	96.2	62.8	15.7	15
Hill	74.5	23.6	99.9	67.9	17.4	118
Terai	72.8	11.1	97.3	65.1	6.4	267
Total	**72.3**	**15.4**	**98.0**	**65.9**	**10.0**	**400**

*Includes physicians, staff nurse, auxiliary nursing midwife, auxiliary health workers and Health Assistant

*Excluded the "no" response from each of the column characteristics

Table 3.6B: Percentage distribution of clinics providing appropriate assessment to sick young infants by background characteristics

Background Characteristic	Correct indications of PSBI (at least 4)	IMNCI treatment guideline	Use of correct equipment	Assess all severe signs as per IMNCI guideline[1]	Appropriate assessment practice	Total N
Medical qualification						
MBBS	95.2	38.1	100.0	59.5	16.7	42
Pediatrician	100	54.8	96.8	77.4	45.2	31
Others	100	55.6	100.0	100.0	55.6	9
Received training on IMCI/IMNCI						
Yes	97.5	65.0	100.0	75.0	45.0	40
No	97.6	28.6	97.6	66.7	19.0	42
Work elsewhere						
Government	100	48.4	96.8	77.4	38.7	31
Other	96.3	25.9	100.0	63.0	11.1	27
Nowhere	95.8	66.7	100.0	70.8	45.8	24
Age						
>30	92.3	46.2	100.0	69.2	30.8	13
30-40	97.9	45.8	97.9	70.8	33.3	48
<40	100	47.6	100.0	71.4	28.6	21
Total	**97.6**	**46.3**	**98.8**	**70.7**	**31.7**	**82**

[1] WHO defines clinical signs of PSBI as: Fast breathing, fever, hypothermia (low temperature), severe chest in-drawing, poor/ no feeding, movement only with stimulation and convulsion. Reporting of all these signs to identify those who need injectable antibiotics have been considered.

3.3 Treatment of sick young infants in private medicine shops and clinics

On an average each medicine shops reported to treat 53 sick young infants in the six months preceding the survey whereas for clinics this was 105 sick young infants. Compared to overall volume of the cases, the proportion of cases for infants below 1 month was lower; only 17 cases for medicines shops and 41 cases for clinics. Further the outlets were asked on the type of treatment they provide to the sick young infants; and reported use of injectable antibiotics was 20% among medicine shops, with highest use in remote clusters (36%) whereas in clinics this was reported to be 46%.. Steroids use, as treatment for sick young infants in medicine shops was 11% compared to 21% in clinics (Table 3.7).

Table 3.7: Percentage distribution of medicine shops and clinics by volume of sick young infants treated and the type of treatment provided in the past 6 months

Variables	Medicine Shops				Clinics	
	Proximal	Semi-proximal	Remote	Total	Outpatient %	Inpatient %
No. of sick young infants 0-2 months treated in the past 6 months						
1 – 10	27.0	41.7	28.2	31.0	19.5	7.3
11 – 20	28.0	15.7	27.6	24.8	13.4	7.3
21 and more	45.0	42.6	44.1	44.2	67.1	11.0
Mean no. of infants 0-2 months treated	53 (sd:100)				105(sd:177)	9 (sd:23)
No. of sick young infants 0-1 months treated in the past 6 months						
None	17.8	13.8	13.5	15.7	3.7	81.7
1 – 10	57.1	56.4	58.4	57.2	46.3	11.0
11 – 20	3.8	13.1	16.4	9.2	18.3	3.7
21 and more	21.3	16.7	11.8	17.8	31.7	3.7
Mean no. of infants 0-1 months treated	17 (sd. 41)				41 (sd: 94)	3 (sd:11)
Type of treatments provided to sick young infants 0-2 months#						
Oral antibiotics	100.0	100.0	96.8	99.2	93.9	
Injectable antibiotics	13.9	17.2	35.6	20.2	46.3	
Bronchodilators	50.2	37.4	33.8	42.9	42.7	
Analgesics/Anti-pyretic	20.2	7.0	9.0	14.1	11.0	
Steroids	10.7	10.8	11.1	10.8	20.7	
Others	0.2	5.0	1.3	1.7	2.4	
Total (N)	**200**	**100**	**100**	**400**	**82**	

#Multiple responses

More than three-quarters of all respondents reported the following signs as those most commonly considered to determine when young infants needed oral antibiotics: fever, followed by respiratory rate/fast breathing, and physical examination including use of stethoscope to listen to the chest (Table 3.8). About 2% of service providers reported treating all young infants with antibiotics, irrespective of the clinical signs.

The most common first line oral antibiotic used to treat sick young infants was amoxicillin (62% in medicine shops and 65% in clinics), followed by cefixime (35% in medicine shops and 39% in clinics) (Table 3.8). Drops were the most common formulation reported for oral antibiotics, followed by oral syrup/suspension.

Less than a third of service providers at medicine shops and clinics reported administering the first dose of antibiotics at the shop to all cases (Table 3.8).

Table 3.8: Percentage distribution of medicine shops and clinics by use of oral antibiotics to treat sick young infants 0 -2 months

Variables	Medicine Shops				Clinics %
	Proximal	Semi-proximal	Remote	Total	
Provided oral antibiotics for treating sick infants 0-2 months in the past 6 months					
None of them	0.0	0.0	3.2	0.8	6.1
Some of them	67.4	50.3	56.5	60.4	56.1
Most of them	28.6	33.6	36.8	31.9	35.4
All of them	3.5	16.1	3.5	6.6	2.4
Don't know	0.5	0.0	0.0	0.3	0.0
Total	200	100	100	400	82
Signs considered to determine that infants need oral antibiotics#					
Treat all with antibiotics	2.0	1.5	0.6	1.6	0.0
Based on respiratory rate/ fast-breathing	83.5	94.8	92.0	88.4	88.3
Fever	90.0	96.9	90.9	92.0	88.3
Physical examination including use of stethoscope listening to the chest	77.2	81.5	70.4	76.6	81.8
General condition – looks unwell	27.6	40.8	20.3	29.2	53.2
Severe chest in-drawingin-drawing	70.6	72.0	66.6	70.0	66.2
Diarrhea	3.2	2.9	2.5	2.9	0.0
Cough	4.4	0.0	8.0	4.2	0.0
Others	4.3	9.8	13.2	7.9	15.6
Oral antibiotics normally used as 1st line for treating sick young infants 0-2 months					
Amoxicillin	54.5	65.8	74.9	62.3	64.9
Cotrim	6.0	12.7	8.2	8.3	7.8
Amox-clavulanate	6.2	10.4	1.8	6.2	16.9
Azithromycin	6.1	4.0	8.3	6.1	3.9
Cefixime	41.2	30.2	27.9	35.2	39.0
Cefuroxime	0.9	0.0	0.3	0.5	0.0
Cefpodoxime	0.7	7.3	2.3	2.8	16.9
Others	1.3	3.9	9.9	4.0	3.9
Formulation of antibiotics normally prescribed for treating sick young infants 0-2 months #					
Oral suspension	52.4	33.8	41.6	45.1	44.2
Dispersible tablets	0.0	1.7	1.1	0.8	0.0
Non-dispersible tablets/ capsules	0.0	0.1	0.0	0	0.0
Drops	55.6	77.7	74.4	65.7	76.6
Usually administered 1st dose of antibiotics prescribed at the medicine shop/clinic					
Yes, for all cases	25.2	33.2	40.1	30.9	26.0

Variables	Medicine Shops				Clinics %
	Proximal	Semi-proximal	Remote	Total	
Yes, in some cases	60.4	55.3	47.8	56.0	57.1
No	14.4	11.4	12.1	13.1	**16.9**
Total (N)[1]	**200**	**100**	**97**	**397**	**77**

[1] The denominator includes only those service providers who said they give oral antibiotics to sick young infants

Multiple responses.

Most providers at medicine shops reported they did not treat any sick young infant with injectable antibiotics in the last six months. Use in remote clusters was higher, with about one in five service providers reporting treating between 1- 10 with injectable antibiotics (Table 3.9). Among providers who reported using injectable antibiotics, respiratory rate/fast breathing and fever were the most frequently cited signs used to determine whether the infant needed injectable antibiotics (Table 3.9).

In medicine shops, gentamicin was the most commonly used injectable antibiotic reported by providers, followed by cefotaxime. In clinics, the most commonly used first line injectable antibiotics reported were ampicillin, cefotaxime and ceftriaxone. Most (74%) shop providers who used injectable antibiotics reported never using second line injectable antibiotics as compared to 29% in clinics (Table 3.9).

Table 3.9: Percentage distribution of the medicine shops and clinics by use of injectable antibiotics to treat sick young infants 0 -2 months

Variables	Medicine Shops				Clinics %
	Proximal	Semi-proximal	Remote	Total	
Number of sick young infants 0-2 months treated with injectable antibiotics in the past 6 months					
None	86.6	82.8	67.1	80.8	53.7
1 – 10	8.2	9.4	20.7	11.6	18.3
11 – 20	0.7	2.9	6.4	2.7	13.4
21 -30	1.0	0.0	2.4	1.1	3.7
31-40	0.5	0.0	1.0	0.5	1.2
41-50	2.7	0.0	0.1	1.4	4.9
>50	0.2	4.9	0.3	1.4	4.9
Don't know	0.1	0.0	1.9	0.5	
Mean	16 (sd:19.8)				53(sd:130.0)
Total(N)	200	100	100	400	82
No. of sick infants 0-1 month among those infants treated with injectable antibiotics in the past 6 months [1]					
None	42.5	21.0	37.8	35.7	21.0
1 – 10	33.9	45.0	49.0	42.8	52.6
11 – 20	10.2	16.5	7.4	10.4	7.9
21 -30	11.3	8.8	0.0	5.9	2.6
31-40	0.0	0.0	0.0	0.5	5.3
41-50	0.0	0.0	0.0	0.0	0.0
>50	0.0	8.8	0.0	2.0	10.5

Variables	Medicine Shops				Clinics %
	Proximal	Semi-proximal	Remote	Total	
Don't know	0.7	0.0	5.8	2.7	
Mean	9 (sd:13.3)				31 (sd:64.3)
Total	27	17	33	77	38
Signs considered to determine that infants need injectable antibiotics #					
Treat all with injectable antibiotics	1.1	0.0	0.0	0.5	2.6
Respiratory rate/ fast-breathing	10.1	14.6	32.2	16.8	89.5
Fever	12.6	13.3	27.2	16.4	86.8
Low temperature	3.1	6.2	5.7	4.5	55.3
Severe chest in-drawing	9.6	9.1	23.0	12.8	68.4
Poor feeding	5.5	14.7	23.9	12.4	92.1
Movement only with stimulation	5.5	8.9	9.8	7.5	52.6
Convulsions	2.5	5.9	3.5	3.6	34.2
Other	3.0	3.0	3.6	3.1	21.1
Never	86.1	82.8	64.4	79.8	0.0
Total	200	100	100	* 400	38
Specific injectable antibiotics used normally as 1st line for treating sick young infants 0-2 months [1]					
Gentamicin*	51.3	33.5	63.0	52.6	21.1
Cefotaxime	20.1	47.2	15.8	24.0	28.9
Ceftriaxone	19.9	16.5	21.5	19.9	23.7
Ampicillin*	15.7	8.8	16.0	14.3	36.8
Amikacin	8.6	19.7	0.0	7.2	15.8
Penicillin	0.0	0.0	2.3	1.0	0.0
Cefuroxime	0.0	0.0	0.0	0.0	2.6
Others	0.0	0.0	0.5	0.2	7.9
Don't know	0.0	0.0	5.0	2.2	0.0
Specific injectable antibiotics used normally as 2nd line for treating sick young infants 0-2 months [3]					
Gentamicin	0.2	0.0	0.0	0.1	0.0
Ampicillin	0.2	0.0	0.4	0.2	5.3
Ceftriaxone	17.4	8.8	11.4	12.9	26.3
Cefuroxime	0.0	3.3	1.7	1.4	2.6
Cefotaxime	21.9	8.2	0.0	9.3	10.5
Amikacin	3.6	0.0	0.8	1.6	0.0
Others	0.2	8.8	0.5	2.2	34.2
Never use/ Refer	60.4	71.0	85.3	73.6	28.9
Total	**28**	**17**	**36**	**81**	**38**

Multiple responses.

[1] The denominators include those service providers who had treated infants of 0-2 months with injectable antibiotics in the past six months.

Few providers followed the recommended practices for administration of first line oral antibiotics (Table 3.10). The majority of service providers were not providing the correct recommended dosage, but most were able to report the correct frequency and duration (Table 3.10). Of the medicine shops reporting use of amoxicillin, only 19% of them correctly mentioned recommended dosage versus 48% of clinics. However, for the recommended frequency and duration, both medicine shops and clinics reported satisfactorily (Table 3.10).
In medicine shops, the most commonly used reference material to determine appropriate antibiotics and doses for treating sick infants recorded was various course books (38%), followed by CIMS (37%) and IMNCI guidelines (14%) (Table 3.12A). In clinics, physicians mostly used IMNCI guidelines (41%), followed by various course books (39%).

About 65% of service providers in medicine shops (87% in clinics) reported weighing the infant to determine the appropriate antibiotic dose, while 35% (10% in clinics) said they determined the dose by age of the infant. Of providers who reported using weight to determine the antibiotic dose, 74% in shops (92 % in clinics) said they use mg/kg and 26% (9% in clinics) said they use weight bands to determine the dose (Table 3.12A).

Table 3.10a: Percentage distribution of medicine shops and clinics reporting to use first line oral antibiotics to treat sick young infants by their recommended dosage, frequency and duration : private medicine shop

Use of Specific Oral antibiotic [1]	Amoxicillin[2]	Cotrim	Amox-clavulanate	Azithromycin	Cefixime	Cefuroxime	Cefpodoxime
Dosage							
Recommended dosage [3]	19.0	20.3	13.0	23.8	12.6	20.0	28.6
Frequency (per day)							
Recommended frequency [3]	100.0	83.0	82.6	71.4	94.0	40.0	85.7
Duration (# of days)							
Recommended duration [3]	94.0	79.0	21.7	90.5	98.1	80.0	85.7
Overall correct (dose, frequency and duration)	19.0	-	-	-	-	-	-
Total (N)	294	48 *	23 *	21	103	5 *	14 *

Table 3.10b: Percentage distribution of medicine shops and clinics reporting to use first line oral antibiotics to treat sick young infants by their recommended dosage, frequency and duration : private clinics

Use of Specific Oral antibiotic [1]	Amoxicillin[2]	Cotrim	Amox-clavulanate	Azithromycin	Cefixime	Cefuroxime	Cefpodoxime
Dosage							
Recommended dosage [3]	48.0	33.3	23.1	0.0	36.7	-	53.8
Frequency (per day)						-	
Recommended frequency [3]	100.0	100.0	92.3	100.0	83.3	-	84.6
Duration (# of days)						-	
Recommended duration [3]	100.0	100.0	46.2	100.0	93.3	-	100.0
Overall correct (dose, frequency and duration)	48.0	-	-	-	-	-	
Total	50	6	13 *	3	30 *	-	13

1 The denominators include service providers who named listed oral antibiotics when asked to name 1st line antibiotics commonly used by them

2 IMNCI recommends oral amoxicillin as the first line of treatment for sick young infants 0-2 months age. While calculating the recommended dosage, frequency and duration of amoxicillin, the criteria in IMNCI guideline by Child Health Division has been considered. In case of dosage, weight, weight band as well as the age of the infant has been considered as per the IMNCI guideline.

3 While calculating the recommended dosage, frequency and duration of other oral antibiotics, the standard pediatrics text books followed by pediatricians (Drug Dosages in children by Dr. Meharban Singh and Text Book of Essential pediatrics by O.P Ghai) has been taken as reference. Since the standard books do not recommend using age to calculate the recommended dosage, those respondents who said they use age to calculate the dose have been considered as not practicing the correct dosing method.

* A few cases are missing

Notably, among the medicine shops using gentamicin, around one-third of them were able to report the recommended dosage as per IMNCI guidelines; this figure was similarly 38% in clinics (Table 3.11). The sample size was too small to assess use of second line injectable antibiotics.

Table 3.11a: Percentage distribution of medicine shops and clinics reporting to use first line injectable antibiotics to treat sick young infants by their recommended dosage, frequency and duration : medicine shops

Use of Specific Injectable antibiotic as 1st line [1]	Gentamicin[2]	Ampicillin[2]	Penicillin	Ceftriaxone	Cefotaxime	Amikacin
Dosage [3]						
Recommended dosage	34.0	46.2	0.0	29.4	40.0	75.0
Frequency (per day)						
Recommended frequency	94.0	61.5	0.0	100.0	85.0	100.0
Duration (# of days)						
Recommended duration	30.0	38.5	0.0	17.6	20.0	50.0

Use of Specific Injectable antibiotic as 1st line [1]	Gentamicin[2]	Ampicillin[2]	Penicillin	Ceftriaxone	Cefotaxime	Amikacin
Overall correct for first line (dose, frequency and duration)	12.0	23.1	0	0	0	0
Total	50	13*	1	17	20*	4

Table 3.11b: Percentage distribution of medicine shops and clinics reporting to use first line injectable antibiotics to treat sick young infants by their recommended dosage, frequency and duration : private clinics

Use of Specific Injectable antibiotic as 1st line [1]	Gentamicin*	Ampicillin*	Cefuroxime	Ceftriaxone	Cefotaxime	Amikacin
Dosage [3]						
Recommended dosage	37.5	50.0	0.0	33.3	72.7	83.3
Frequency (per day)						
Recommended frequency	87.5	85.7	0.0	100.0	81.8	100.0
Duration (# of days)						
Recommended duration	25	64.3	100.0	44.4	54.5	100.0
Overall correct for first line (dose, frequency and duration)	12.5	57.1	0	0	0	0
Total	8	14	1	9	11*	6

1 The denominators include service providers who used injectable antibiotic to treat 0-2 months

2 IMNCI recommends injection Gentamicin and Ampicillin as first line injectables for treating sick young infants. In case of these two antibiotics, recommended dosage, frequency and duration have been calculated based on IMNCI guideline. For other injectable antibiotics, standard pediatrics textbook has been taken as the reference.

3 Since the standard books do not recommend using age to calculate the recommended dosage, for other injectable antibiotics, those who said they use age to calculate the dose have been considered as not practicing the correct dosing method.

*Few missing cases.

Table 3.12A: Percentage distribution of medicine shops and clinics by their use of reference materials and approach to determine antibiotic dose for treating the sick young infants

Variables	Medicine Shops				Clinics %
	Proximal	Semi-proximal	Remote	Total	
Reference materials/job aids used to determine appropriate antibiotics and dose for treating sick young infants					
IMNCI treatment guide	12.9	19.4	10.6	14.0	41.5
CIMS	43.0	39.7	22.9	37.3	26.8
MIMS	6.1	12.7	0.8	6.5	7.3
Course book	37.5	37.3	39.7	38.0	39.0
Internet	16.1	9.5	2.3	11.0	24.4
Medicine and pharmacy books	2.8	3.1	5.7	3.6	0.0
Others	6.7	5.7	6.8	6.5	3.7
No reference materials used	24.1	22.9	28.8	25.0	14.6
Approach used to determine the appropriate antibiotic dose					
By age	29.6	29.7	49.2	34.5	9.8

Variables	Medicine Shops				Clinics %
	Proximal	Semi-proximal	Remote	Total	
By weight	70.4	68.3	49.4	64.6	86.6
Others	0.0	2.0	1.5	0.9	3.7
Total (N)	200	100	100	400	82
Unit of weight used to determine dose of antibiotic infants 0-2 months [1]					
By mg/kg	71.8	79.3	71.6	73.8	91.5
Weight bands	28.2	20.7	28.4	26.2	8.5
Approach used to determine the baby's weight [1]					
Weigh baby using Salter scale	2.9	4.4	4.0	3.5	12.7
Weigh baby using Pan scale	6.4	4.4	8.0	6.2	50.7
Weigh baby using adult scale (difference method)	82.1	80.9	68.0	79.1	36.6
Estimate weight by looking at child	8.6	10.3	20.0	11.2	-
Total (n)	140	68	50	258	71
Practices of taking baby's weight [2]					
Leave baby's clothes on	96.9	96.7	100.0	97.4	80.3
Remove baby's clothes	3.1	3.3	0.0	2.6	19.7
Total (n)	129	61	39	229	71
Correct method to determine dose by weight [3]	2.8	2.9	0.0	2.3	19.7
Minimum duration of injectable treatment practice normally [4]					
Don't give injectable					
1 day	6.1	7.7	12.2	9.2	0.0
2 days	2.5	0.0	7.8	4.3	10.5
3 days	18.6	24.6	24.0	22.3	15.8
4 days	4.7	0.0	1.3	2.2	2.6
5 days	55.6	56.6	42.1	49.8	36.8
> 5 days	12.6	11.1	12.6	12.3	34.2
Mean	5 (sd:1.6)				5(sd:1.8)
Total	28	17	33	81	38
Shorter treatment option practiced					
Very common (i.e. more than half the time)	2.0	18.5	3.5	6.5	7.3
Somewhat common	47.7	35.9	32.4	41.0	32.9
Not very common	29.2	22.7	30.9	28.0	22.0
Never happens	21.1	22.9	33.1	24.5	37.8
Total (N)	200	100	100	400	82

1 The denominators include those service providers who said they determined appropriate antibiotic dose on the basis of weight of the infants.

2 The denominators exclude those service providers who said they estimated the infants' weight simply by looking at them.

3 Use of Salter or pan scale to weigh baby and removing child's clothes to take weight.

4 The denominator includes only those who said they give injectable antibiotic to sick young infants.

* Percentage may add up to more than 100 because of multiple responses.

*Few (2) cases are missing

The recommended equipment to weigh the infant is a pan scale or salter scale. However, only 4% of medicine shop service providers. used a salter or pan scale to weigh a baby. However, 79% medicine shops and 37% clinics used adult scale to weigh the infant. About 11% of service providers in medicine shops said they estimated the weight by just looking at the child, and this practice was highest in remote clusters (20%).

The recommended practice of removing the baby's clothes while weighing was reported by only 3% of service providers in medicine shops and 20% in clinics (Table 3.12A). The correct method of using a salter or pan scale and removing the baby's clothes to take the weight in order to determine the dose of antibiotic was recorded to be practiced by only two percent of service providers in medicine shops and 20% of providers in clinics.

Among service providers who reported using injectable antibiotics, 47% of medicine shops and 70% of clinics reported never giving only single dose of injectable antibiotic treatment to non-referred infants (Table 3.12B). Only 5% of medicine shops and 6% clinics reported that it was very common for them to give a single dose of such treatment, rather than have the infant brought back to the medicine shop an additional day for another dose.

Just under 90% medicine shops and 81% of clinics said they would never administer injectable steroids to sick infants 0-2 months, while 9% of medicine shops and 18% of clinics said they would use injectable steroids if the child had signs of critical illness.

Out of 44 service providers in medicine shops who reported using injectable steroids, 56% reported treating 1-10 sick infants with injectable steroids in the last six months. Among those, the use of steroids was highest in semi-proximal clusters (90%) (Table 3.12B).

Table 3.12B: Percentage of medicine shops and clinics by their practice of shorter treatment option and giving injectable steroids to sick young infants in private medicine shops

Variables	Medicine Shops				Clinics %
	Proximal	Semi-proximal	Remote	Total	
Practice of giving single dose injectable antibiotic treatment to non-referred cases [1]					
Very common (i.e. more than half the time)	1.1	11.0	4.6	4.8	6.1
Somewhat common	24.5	28.9	7.0	17.7	17.1
Not very common	42.5	18.8	27.1	30.6	7.3
Never happens	32.0	41.4	61.2	46.9	69.5
Total (N)	28	17	36	81	82
Circumstances under which injectable steroids are used for treating sick young infants 0-2 months					
When child has signs of critical illness	8.0	10.5	9.9	9.1	18.3
When child is not responding to initial treatment	3.8	5.2	2.1	3.7	6.1
Others	3.8	3.4	3.9	3.7	1.2
Never	89.3	89.2	88.9	89.2	79.3
Total (N)	200	100	100	400	82
Practice of administering injectable steroids to sick young infants 0-2 months [2]					
Somewhat common	4.8	70.0	63.6	35.7	29.4
Not very common	61.9	20.0	36.4	45.2	35.3
Never happens	33.3	10.0	0.0	19.0	35.3
Total (N)	21	10	11	* 42	17
No. of sick young infants who are administered steroids in the past 6 months					
None	54.5	10.0	18.2	34.9	41.2
1 - 10	36.4	90.0	63.6	55.8	52.9
11+	9.1	0.0	18.2	9.3	0.0

Variables	Medicine Shops				Clinics %
	Proximal	Semi-proximal	Remote	Total	
Don't know	0.0	0.0	0.0	0.0	5.9
Mean	5 (sd:9.59)				5 (sd:3.04)
Total (N)	22	10	11	* 43	17

* Few (2) cases are missing

1 The denominator excludes those service providers who had never treated infants of 0-2 months with injectable antibiotics

2, The denominators include those service provides who reported to using injectable steroids to treat sick young infants 0- 2 months

The appropriateness of the treatment practices by service providers at medicine shops and clinics were assessed by their background characteristics. While noting the smaller sample size of 81 medicine shops providers, none of them were following all five correct treatment practices (using injectable antibiotics for PSBI cases; using appropriate first line antibiotics; not using injectable steroids; correct weighing and dosing practices; appropriate dose, frequency, and duration). Use of appropriate first line injectable antibiotics was slightly higher among service providers with medical qualifications (70%) compared with those without (50%). On the contrary, no use of injectable steroids was higher among those with no formal medicine education than their counterparts (54% versus 63%). Use of appropriate injectable antibiotics was also quite high among service providers aged 30 or older than their younger counterparts. However, just over half of service providers in medicine shops were able to report the correct indication for prescribing injectable antibiotics for PSBI cases (Table 3.13A).

Table 3.13A: Percentage distribution of the medicine shops providing appropriate injectable treatment services to sick young infants by their background characteristics (among those reporting providing any injectable treatment)

	Correct indication for injectable antibiotic[1]	Use of gentamicin or ampicillin as first line[2]	No use of steroids	Appropriate weighing for dosing[3]	Appropriate dose frequency duration[4]	Appropriate injectable treatment	Tota l N
Age (years)							
<30	63.4	49.4	62.0	0.0	0.0	0.0	16
30-40	57.7	61.6	71.8	0.0	5.4	0.0	33
>40	51.1	78.1	35.0	4.8	22.0	0.0	31
Medical qualification							
Medical	57.5	69.9	53.5	2.4	10.7	0.0	63
Non-medical	52.2	49.7	63.1	0.0	11.0	0.0	18
Work elsewhere							
Government HF	73.0	93.0	80.0	8.2	7.6	0.0	18
Other	*5.6*	*3.2*	*43.8*	*0.0*	*0.0*	*0.0*	2**
Nowhere	53.2	59.5	48.6	0.0	12.1	0.0	60
Proximity to hospital							
Proximal	56.4	65.7	44.3	0.0	0.3	0.0	28
Semi Proximal	61.9	42.3	45.7	8.8	10.5	0.0	17
Remote	53.5	76.6	69.3	0.0	19.0	0.0	36

	Correct indication for injectable antibiotic[1]	Use of gentamicin or ampicillin as first line[2]	No use of steroids	Appropriate weighing for dosing[3]	Appropriate dose frequency duration[4]	Appropriate injectable treatment	Tota l N
DDA Registration							
Yes	61.1	70.8	55.0	0.0	6.8	0.0	37
No	52.2	61.0	56.1	3.5	14.1	0.0	44
Trained on IMNCI/NCP							
Yes	68.2	88.4	64.6	6.4	4.0	0.0	23
No	51.4	56.1	51.9	0.0	13.5	0.0	57
Ecological region							
Mountain	*64.2*	*73.4*	*78.6*	*0.0*	*10.9*	*0.0*	*4***
Hill	56.3	83.6	68.1	0.0	23.1	0.0	31
Terai	55.5	52.5	45.1	3.3	2.4	0.0	46
Total	**56.3**	**65.5**	**55.6**	**1.9**	**10.7**	**0.0**	**81**

[1] Correctly cites at least 4 indications for injectable treatment for PSBI signs as cited in WHO IMNCI guideline

[2] IMNCI recommends Injection Gentamicin and Injection Ampicillin as the first line injectable antibiotics for sick young infants 0-2 months of age. Thus, the use of either of these two injectable antibiotics has been taken into consideration.

[3] The recommended method for weighing the infant is using pan scale or salter scale and removing the baby's clothes. The correct method of dosing the antibiotic is by the weight of the infants, which can be by mg/ Kg or by weight bands. Thus, the practitioners weighing the baby in pan or salter scale by removing the baby's clothes and calculating the dose by mg/ Kg or by weight band have been considered as practicing the correct method for weighing and dosing.

[4] Appropriateness as defined by IMNCI protocol for gentamicin and ampicillin

**-Sample size of 5 or fewer cases

Table 3.13B represents the 46% of providers at clinics that reported giving injectable treatments. With a sample of only 38 providers, the subset is too small to be able to allow for broader conclusions. With that caveat in mind, it is worth noting that approximately only 5% of these physicians were providing appropriate injectable treatment practices in the clinics. Around 16% of the physicians reported appropriate dose, frequency, and duration (Table 3.13B).

Table 3.13B: Percentage distribution of the private clinics providing appropriate treatment services to sick young infants by their background characteristics

	Appropriate indication for injectable antibiotic use[1]	Use of either gentamicin or ampicillin as first line[2]	No use of steroids	Appropriate weighing for dosing[3]	Appropriate dose frequency duration[4]	Appropriate injectable treatment practice	Total N
Medical qualification							
MBBS	100	55.6	72.2	16.7	16.7	5.6	18
Pediatrician	100	40.0	73.3	13.3	20.0	6.7	15
Others	*100*	*20.0*	*60.0*	*80.0*	*0.0*	*0.0*	*5***
Received training on IMCI/IMNCI							
Yes	100	35.3	58.8	23.5	17.6	5.9	17
No	100	52.4	81.0	23.8	14.3	4.8	21

	Appropriate indication for injectable antibiotic use[1]	Use of either gentamicin or ampicillin as first line[2]	No use of steroids	Appropriate weighing for dosing[3]	Appropriate dose frequency duration[4]	Appropriate injectable treatment practice	Total N
Work elsewhere							
Government HF	100	50.0	71.4	35.7	21.4	14.3	14
Other	100	63.6	72.7	9.1	18.2	0.0	11
Nowhere	100	23.1	69.2	23.1	7.7	0.0	13
Age							
<30	*100*	*0.0*	*50.0*	*0.0*	*0.0*	*0.0*	*2***
30-40	100	46.4	71.4	32.1	17.9	7.1	28
>40	100	50.0	75.0	0.0	12.5	0.0	8
Total	**100**	**44.7**	**71.1**	**23.7**	**15.8**	**5.3**	**38**

[1] Correctly cites at least 4 indications for injectable treatment for PSBI signs as cited in WHO IMNCI guideline

[2] IMNCI recommends Injection Gentamicin and Injection Ampicillin as the first line injectable antibiotics for sick young infants 0-2 months of age. Thus, the use of either of these two injectable antibiotics has been taken into consideration.

[3] The recommended method for weighing the infant is using pan scale or salter scale and removing the baby's clothes. The correct method of dosing the antibiotic is by the weight of the infants which can be by mg/ Kg or by weight bands. Thus, the practitioners weighing the baby in pan or salter scale by removing the baby's clothes and calculating the dose by mg/ Kg or by weight band have been considered as practicing the correct method for weighing and dosing.

[4] Appropriateness as defined by IMNCI protocol for gentamicin and ampicillin

**-Sample size of 5 or fewer cases

Table 3.13C shows that only 12% of the medicine shops reported appropriate oral antibiotic treatment. Medicine shops from remote cluster were more common (21%) to report the appropriate treatment compared to the medicine shops from proximal cluster (8%). Likewise, medicine shops from hilly region were more common (21%) to report the appropriate treatment compared to the medicine shops from Terai region (9%).

Similarly, Table 3.13D shows that 30% of the clinics reported appropriate oral antibiotic treatment. Major limitation on the appropriate treatment was identified to be treatment with inappropriate dose or frequency or duration of antibiotics which was reported by 79% of the clinics.

Table 3.13C: Percentage distribution of the medicine shops providing appropriate oral antibiotic treatment services to sick young infants by their background characteristics (among those reporting providing any oral antibiotics)

	Correct indication for oral antibiotic[1]	Use of amoxicillin as first line	Appropriate dose frequency duration[4]	Appropriate oral antibiotic treatment	Total N
Age (years)					
<30	96.8	61.6	13.6	13.6	94
30-40	93.0	54.4	11.1	10.6	179
>40	96.4	74.2	14.0	14.0	124
Medical qualification					
Medical	97.9	62.2	14.6	14.3	298
Non-medical	86.0	62.7	6.4	6.4	98

	Correct indication for oral antibiotic[1]	Use of amoxicillin as first line	Appropriate dose frequency duration[4]	Appropriate oral antibiotic treatment	Total N
Work elsewhere					
Government HF	99.6	85.9	19.9	19.9	58
Other	100.0	71.5	19.7	19.7	13
Nowhere	93.9	57.7	11.0	10.7	325
Proximity to hospital					
Proximal	93.0	54.5	8.2	8.2	200
Semi Proximal	97.1	65.8	13.5	12.5	100
Remote	96.7	74.9	20.7	20.7	97
DDA registration					
Yes	94.2	60.6	12.3	12.3	216
No	95.9	64.3	13.0	12.4	181
Trained on IMNCI/NCP					
Yes	90.1	58.8	16.9	16.9	109
No	96.8	63.7	11.0	10.6	288
Ecological region					
Mountain	93.3	80.5	9.2	9.2	15
Hill	99.0	81.8	21.3	21.3	115
Terai	93.3	52.9	9.0	8.7	267
Total	**94.9**	**62.3**	**12.6**	**12.4**	**397**

1-Reported basing on respiratory rate/fast-breathing and or physical examination including use of stethoscope to listen to the chest)

Table 3.13D: Percentage distribution of clinics providing appropriate oral antibiotic treatment services to sick young infants by their background characteristics

	Correct indication for oral antibiotic1	Use of amoxicillin as first line	Appropriate dose frequency duration4	Appropriate oral antibiotic treatment	Total N
Medical qualification					
MBBS	97.5	77.5	40.0	40.0	40
Pediatrician	93.1	55.2	24.1	20.7	29
Others	100	37.5	12.5	12.5	8
Received training on IMCI/IMNCI					
Yes	100	56.4	17.9	17.9	39
No	92.1	73.7	44.7	42.1	38
Work elsewhere					
Government HF	96.4	67.9	32.1	28.6	28
Other	96.2	69.2	42.3	42.3	26
Nowhere	95.7	56.5	17.4	17.4	23
Age (years)					
<30	100	69.2	32.1	38.5	13
30-40	95.5	70.5	42.3	31.8	44

	Correct indication for oral antibiotic1	Use of amoxicillin as first line	Appropriate dose frequency duration4	Appropriate oral antibiotic treatment	Total N
>40	95.0	50.0	17.4	20.0	20
Total	**96.1**	**64.9**	**31.2**	**29.9**	**77**

1-Reported basing on respiratory rate/fast-breathing and or physical examination including use of stethoscope to listen to the chest)

3.4 Referral Practices of 0-2 months Sick Young Infants

3.4.1 Signs and Symptoms Considered for Referral and Pre-Referral Treatment

Service providers at the medicine shops mentioned, unprompted, that they mostly watched for symptoms like inability to feed (82%), persistent vomiting (76%), unconsciousness or drowsiness (72%), and convulsions or history of convulsions (69%) to recommend referral (Table 3.14). Only 26% reported bulging fontanel as sign considered for referral. Just under a third of service providers in remote areas (29%) did not consider low weight (<1500g) as a serious risk factor compared with those in proximal (62%) and semi-proximal sites (51%). The majority of service providers in clinics reported all these symptoms to assess the seriousness of an infant's medical condition (Table 3.14).

Two-thirds of the providers in medicine shops said they referred severely sick infants to public hospitals and one-fourth referred such cases to private hospitals. The other referral hospitals included non-government hospitals like AMDA in Jhapa and Butwal. While 86% of the referral hospitals were located within the survey districts, the medicine shops also referred sick infants to hospitals located outside the district (14%), with about one-third of the hospitals located at a traveling distance of over 1 hour.

Clinics referred such cases mostly to public hospitals (62%) and most of their referral points were located within the district (83%).

More common referral practices included helping arrange transport/ambulance (65% in medicine shops and 59% in clinics), providing counseling on importance of completing the referral immediately (56% in medicine shops and 59% in clinics), and providing a referral note (52% in medicine shops and 77% in clinics); while calling ahead/communicating with a physician or other staff (20% in medicine shops and 39% in clinics) was less common at both medicine shops and clinics. Whereas only 2% of the medicine shops and 11% of the clinics reported to perform all four practices.

When asked if the service providers had the caregiver of the infant they had referred to other facilities come back to them after completing the treatment or without visiting the referral sites, 43% in medicine shops and 42% in clinics said that they came back to them more than half the time.

Table 3.14: Percentage distribution of the medicine shops and clinics by type of signs considered for referral and by types of hospitals usually referred to

	Medicine Shops				Clinics %
	Proximal	Semi-Proximal	Remote	Total	
Signs considered for referral (unprompted)					
Unable to feed	80.7	84.9	80.8	81.8	79.3
Persistent vomiting	81.6	79.2	59.5	75.5	74.4
Unconscious or drowsy	74.9	66.6	71.0	71.8	84.1
Convulsion/history of convulsion	66.7	78.1	62.9	68.6	74.4
Continuing illness despite treatment	52.1	53.5	47.8	51.4	68.3

	Medicine Shops				Clinics %
	Proximal	Semi-Proximal	Remote	Total	
Too small/weight <1500g	62.3	50.9	28.5	51.0	72.0
Central cyanosis (appears blue)	38.2	52.4	33.5	40.6	67.1
Bulging fontanelle	19.5	29.3	36.5	26.2	64.6
Age cut-off	0.0	0.0	0.0	0.0	13.4
Fever	5.4	3.8	7.5	5.5	0.0
Dehydration	0.8	0.9	1.2	0.9	0.0
Chest in-drawing	2.3	1.2	5.6	2.9	0.0
Others	6.2	10.2	10.4	8.2	19.5
Total	200	100	100	400	82
Usually referred Hospital[1]					
Public hospital	64.1	68.1	75.2	67.9	62.3
Private hospital	30.0	24.3	12.9	24.3	33.8
NGO run hospitals	2.8	4.7	1.5	2.9	0.0
Others	3.1	2.9	10.4	4.9	3.9
Total	200	100	100	400	77
Location of higher level health facilities where referrals are made					
Located within District	92.5	88.0	71.0	86.0	83.1
Located beyond District	7.5	12.0	29.0	14.0	16.9
Time taken to reach the facility					
< 30 minutes	87.4	5.6	5.4	46.4	74.0
30 - < 1 hour	2.6	77.8	6.0	22.2	10.4
1 + hours	10.1	16.6	88.6	31.3	15.6
Total	200	100	100	400	77
Practices of facilitation beside referring to hospital					
Help arrange transport/ambulance	60.2	83.2	57.0	65.3	58.5
Counsel on importance of completing referral immediately	65.2	42.5	51.8	56.3	58.5
Provide referral note/slip	42.2	65.1	57.8	51.8	76.8
Call ahead/communicate with physician or other staff at receiving institution	24.9	16.3	19.6	21.5	39.0
All 4 practices	0.5	3.0	4.0	2.0	11.0
Others	1.1	2.9	2.9	2.0	6.1
Practice of returning to same service provider after referral					
Very common (i.e. more than half the time)	43.0	43.0	44.0	43.3	41.5
Somewhat common	29.5	19.0	29.0	26.8	30.5
Not very common	12.5	28.0	20.0	18.3	17.1
Never happens	15.0	10.0	7.0	11.8	11.0
Total (N)	200	100	100	400	82

Percentage may add up to more than 100 because of multiple responses

[1] Denominators include those shops/clinics that have specific referral points/facilities

3.4.2 Pre-referral Treatment Practices

Less than half of the medicine shops and clinics did not provide any pre-referral treatment to sick young infants. Around 59% of medicine shops in semi-proximal and remote areas provided oral antibiotics to the infants as pre-referral care, compared to 42% at proximal sites. A mere 8% of the medicine shops provided injectable antibiotics (12% clinics). More medicine shops in remote (13%) areas compared with those in proximal (5%) and semi-proximal (8%) sites administered injectable antibiotics to sick young infants as pre-referral treatment. Injectable gentamicin and ceftriaxone were the most commonly reported pre-referral antibiotics administered (Table 3.15).

Table 3.15: Percentage distribution of medicine shops and clinics by their pre-referral treatment practices

	Medicine Shops				Clinics %
	Proximal	Semi-Proximal	Remote	Total	
Treatment practices before referring to hospital					
No pre-referral treatment	49.3	45.7	35.9	45.0	43.9
Oral Antibiotics	42.4	59.5	59.1	50.8	47.6
Injectable Antibiotics	5.1	8.2	13.4	8.0	12.2
Analgesic/Antipyretic	15.1	6.4	8.6	11.3	2.4
Others	2.9	3.0	0.3	2.3	8.5
Total (N)	200	100	100	400	82
Specific pre-referral Injectable antibiotics given as first line 1					
Gentamicin	20.0	25.0	78.6	46.9	30.0
Ampicillin	10.0	0.0	7.1	6.3	10.0
Ceftriaxone	70.0	25.0	0.0	28.1	30.0
Cefuroxime	0.0	37.5	0.0	9.4	0.0
Cefotaxime	0.0	12.5	14.3	9.4	30.0
Total (N)	10	8	14	32	10

[1] Denominators include those service providers who provided injectable antibiotic as pre-referral treatment
Percentage may add up to more than 100 because of multiple responses

3.4.3 Appropriate Referral Practices

Table 3.16A presents the overall referral practices of the service providers at the medicine shops. Overall, none of the medicine shops performed all recommended pre-referral activities: correct indication of severe illness; facilitation of referral; and appropriate pre-referral injectable. Nearly three-fourths of the medicine shops reported facilitating the referral process. This varied by several background characteristics, notably higher among medicine shops with older providers than their younger counterparts and also higher in medicine shops from semi-proximal area than that from the remote area (Table 3.16A). Also, the majority of service providers from clinics were able to provide the correct indication of severe illness (89%) for referral and facilitate referral (81%), Very few (5%) prescribed injectable gentamicin and ampicillin as pre-referral treatment to sick infants (Table 3.16B). Minimal differences in appropriate referral practices were observed by the key background characteristics.

Table 3.16A: Percentage distribution of medicine shops providing appropriate referral to sick young infants by their background characteristics

	Correct indication of severe illness for referral (at least 4 signs)	Facilitate during referral	Appropriate pre-referral injectable Gentamicin/ Ampicillin	Appropriate referral	Total N
Age (years)					
<30	67.3	54.6	3.6	0.0	94
30-40	78.4	77.6	6.2	0.0	182
>40	80.1	80.7	1.9	0.0	124
Medical qualification					
Medical	74.0	71.7	5.5	0.0	302
Non-medical	83.2	77.6	.5	0.0	98
Work elsewhere					
Government HF	66.8	82.7	10.9	0.0	61
Other	54.1	60.3	9.7	0.0	13
Nowhere	79.0	71.9	2.8	0.0	325
Proximity					
Proximal	81.3	71.6	1.7	0.0	200
Semi Proximal	77.0	84.6	2.3	0.0	100
Remote	65.6	64.8	11.4	0.0	100
DDA Registration					
Yes	82.3	74.3	3.0	0.0	112
No	69.0	71.8	5.8	0.0	181
Trained on IMNCI/NCP					
Yes	81.4	79.3	5.0	0.0	112
No	74.3	70.8	4.0	0.0	288
Ecological zone					
Mountain	43.7	55.5	11.4	0.0	15
Hill	73.6	69.9	6.7	0.0	118
Terai	79.4	75.6	2.8	0.0	267
Total	76.3	73.2	4.3	0.0	400

Percentage may add up to more than 100 because of multiple responses.

Table 3.16B: Percentage distribution of clinics providing appropriate referral to sick young infants by their background characteristics

	Correct indication of severe illness for referral (at least 4 signs)	Facilitate during referral	Appropriate pre referral injectable Gentamicin/ Ampicillin	Appropriate referral	Total N
Medical qualification					
MBBS	90.5	81.0	0.0	0.0	42
Pediatrician	87.1	83.9	9.7	6.5	31
Others	88.9	66.7	11.1	11.1	9
Received training on IMCI/IMNCI					
Yes	90.0	77.5	5.0	5.0	40
No	88.1	83.3	4.8	2.4	42
Work elsewhere					
Government HF	87.1	71.0	6.5	6.5	31
Other	92.6	85.2	3.7	3.7	27
Nowhere	87.5	87.5	4.2	0.0	24
Age (years)					
<30	92.3	92.3	0.0	0.0	13
30-40	87.5	81.3	4.2	2.1	48
>40	90.5	71.4	9.5	9.5	21
Total	89.0	80.5	4.9	3.7	82

Percentage may add up to more than 100 because of multiple responses.

3.5 Follow-up and Counseling Services for 0-2 months sick young infants

3.5.1 Follow-up Schedule and Counseling Services

Table 3.17 shows the practice of providers at the medicine shops and clinics for the follow-up of sick infants who are not referred. Follow-up and counseling practices form an integral part of the treatment regime for sick infants. A majority of the service providers (95%) in medicine shops followed-up with the sick infants who were not referred to higher level facilities on specific days (mostly day 3 and 5). Similarly, providers at clinics mostly followed-up with sick infants on the third day (64%), then on the fifth (60%) and seventh day (58%).

Table 3.17: Percentage distribution of medicine shops and clinics by their follow-up practices and advice given to guardian for sick young infants

Follow-up schedule	Medicine Shops				Clinics %
	Proximal	Semi-Proximal	Remote	Total	
Follow-up schedule					
Daily follow up	4.3	2.9	2.5	3.5	1.2
Follow up on specific days	95.0	94.9	96.4	95.3	93.9

Follow-up schedule	Medicine Shops				Clinics %
	Proximal	Semi-Proximal	Remote	Total	
No further contacts made	0.8	2.1	1.1	1.2	4.9
Total (N)	200	100	100	400	82
Specific schedule for follow-up1					
Same day	0.5	1.1	0.0	0.5	0.0
2nd day	27.9	31.6	18.8	26.5	22.1
3rd day	61.1	61.1	68.8	63.0	63.6
4th day	2.1	1.1	5.2	2.6	3.9
5th -7th day	8.4	5.3	7.3	7.3	10.4
Specific days for second follow up					
Do not meet 2nd time	0.5	0.0	2.1	0.8	2.6
2nd day	0.5	0.0	0.0	0.3	1.3
3rd day	3.7	4.2	2.1	3.4	1.3
4th day	5.8	2.1	4.2	4.5	9.1
5th day	74.2	77.9	69.8	74.0	59.7
6th day	4.2	4.2	6.3	4.7	2.6
7th day- 10th day	11.1	11.6	15.6	12.3	23.4
Specific days for third follow up					
Do not meet 3rd time	23.8	17.5	11.5	19.1	15.6
5th day	3.7	5.2	3.1	3.9	-
6th day	4.2	0.0	0.0	2.1	1.3
7th day	50.8	54.6	60.4	54.2	58.4
8th day	4.2	2.1	3.1	3.4	2.6
9th -15th day	13.7	19.8	21.9	17.3	22.1
Total (n)	190	95	96	381	77
Days to re-assess for follow-up or referral					
Day 2 of treatment	17.5	24.1	13.8	18.3	18.3
Day 3 of treatment	72.1	67.1	68.9	70.0	64.6
Day 4 of treatment	5.5	4.3	14.0	7.3	13.4
After Day 4 of treatment	22.0	34.0	43.8	30.5	36.6
Advice given to parents before starting treatment					
Instructions on administering oral antibiotics	79.9	90.1	92.7	85.8	95.1
Danger signs to look for and where they should go	73.1	77.3	59.1	70.8	92.7
When they should bring the baby back for the next follow-up/for next injection	68.7	60.4	45.5	60.8	79.3
Others	13.1	5.4	10.7	10.5	14.6
Total (N)	200	100	100	400	82

Percentage may add up to more than 100 because of multiple responses. [1] The denominators include those service providers who follow up with the sick infants on specific days.

Seventy percent of the service providers in medicine shops and 65% in clinics reported that they reassessed the infants on the third day to decide whether they should continue the treatment or refer them to higher level facilities. When asked if they provided any counseling to the parents/caretakers before starting antibiotic treatment, 86% of the service providers in medicine shops and 95% in clinics said that they provided instruction on how to administer oral antibiotics. While 71% of the medicine shops and 93% of the clinics said they counseled on danger signs and where to seek care if they observed such signs in the infants. Fewer medicine shops in remote clusters reported providing counseling activities than those in proximal and semi-proximal sites (Table 3.17).

3.5.2 Options Provided for Young Infants with Difficulty Completing Full-Course Antibiotic Treatment

In instances where the parents/caretakers of the infants may not be able to afford full course of treatment for their infants, most providers in medicine shops (91%) mentioned that they would offer deferred payment options. Some also said they would suggest treatment with lower cost medicines (28%) or would refer them to a public facility (27%) (Table 3.18). Two-fifths of the service providers in clinics would either offer a deferred payment option or refer to a public facility.

On being asked what would they do if an infant developed side effects to their treatment, 63% of providers in medicine shops said they would refer to the hospital while 54% said they would discontinue the treatment. About 65% of service providers in clinics reported that they would discontinue the treatment, and roughly a half of reported that they would refer to a hospital or switch to an alternative medicine.

When encountered with a situation where caretakers refuse to continue treatment for their infants, three-quarters of providers in medicine shops and four fifths of the clinics said they would counsel on the importance of completing treatment. However, only 50% of the medicine shops and 56% of the clinics mentioned that they would just refer to another facility.

Service providers were asked under what circumstances, if any, they shortened the course of antibiotics for infants. Nearly one-fourth of providers from both medicine shops and clinics said they never abbreviated the course. Just over a half (51%) of medicine shops and 46% of the clinics mentioned that they cut it short if they see improvement in the infant's condition, while 46% of the medicine shops and 43% of the clinics mentioned they shorten the course if the infant develops any side effect to the treatment.

Service providers were further asked what actions they took for those infants who would not return for follow up. More than half of providers in shops and two-thirds of providers in clinics reported they did not take any follow up action. Those who took action reported calling families to find what was going on (31% for both) or sending someone to the family to inquire about the health of the infants (14% medicine shops, 2% clinic) (Table 3.18).

Table 3.18: Percentage distribution of medicine shops and clinics by steps taken/options provided for sick young infants not opting for full term antibiotic treatment

	Medicine shops				Clinics %
	Proximal	Semi-Proximal	Remote	Total	
Options provided for those who can't afford full course of treatment*					
Offer deferred payment option	89.4	89.0	94.0	90.5	48.8
Suggest treatment with lower cost medicines	24.3	34.2	28.2	27.8	34.1
Refer to public facility	26.0	36.4	19.8	27.0	42.7
Don't know/never happens	5.9	4.0	4.4	5.0	15.9
Shorten the course of treatment	4.0	7.1	4.3	4.8	7.3
Give free treatment	2.6	3.2	3.8	3.0	17.1
Others	0.1	0.5	0.9	0.4	2.4
Measures taken if infant develops side effects to treatment *					
Discontinue treatment	52.3	62.9	49.2	54.3	64.6
Refer to hospital	67.2	66.2	49.1	62.5	48.8
Switch to alternative medicine	22.7	33.3	40.6	29.8	52.4
Don't know/never happens	16.0	11.9	25.8	17.5	14.6
Measures taken if caregivers refuse to continue treatment *					
Counsel on importance of completing treatment	73.4	79.5	70.8	74.3	80.5
Refer	50.3	59.1	39.3	49.8	56.1
Offer an alternative treatment	5.1	17.2	12.8	10.0	19.5
Discontinue treatment	14.0	18.5	7.0	13.5	8.5
Others	0.4	0.0	0.0	0.3	3.7
Don't know/never happens	8.5	7.4	16.7	10.3	9.8
Circumstances that can lead to shortening the course of antibiotic treatment in sick young infant *					
When child's condition improves	44.3	57.3	56.4	50.5	46.3
If child develops side effects	47.9	48.7	37.6	45.5	42.7
If caregivers cannot afford full course	9.8	21.4	7.7	12.3	14.6
If caregivers refuse to continue	11.1	29.0	14.8	16.5	25.6
Never abbreviate course	29.9	19.9	18.4	24.5	26.8
Actions taken for those who do not return for follow-up*					
Phone family	28.6	38.8	27.5	31.0	30.5
Send someone to find the family	11.3	18.1	16.3	14.3	2.4
No action is taken	62.4	47.4	59.6	58.0	67.1
Total (N)	200	100	100	400	82

* Percentage may add up to more than 100 because of multiple responses

3.5.3 Appropriate Follow-up and Counseling Services

Appropriate follow-up practice consists of following up with non-referred sick young infants on the third and fifth days, providing appropriate advice to parents or guardians before starting the treatment, and following up on infants who are not returned for treatment as expected. About one-half of service providers said that they meet non-referred infants for follow-up on third and fifth days. Nearly one-third of the medicine shops

provided adequate information to the parents/guardians regarding antibiotic use while starting the treatment however this practice was lower in the younger age group and among providers not trained on IMNCI/NCP (Table 3.19A). Moreover, most medicine shop providers did not adhere to the practice of inquiring about infants who do not return for follow-up as expected. Overall, very few of the medicine shop providers (5%) practiced all appropriate measures of follow-up and counseling (Table 3.19A).

Table 3.19A: Percentage distribution of the medicine shops providing appropriate follow up and counseling practices for sick young infants

	Appropriate minimum schedule	Appropriate advice to parents	Appropriate action for not coming to follow up	Appropriate follow up	Total N
Age (years)					
<30	61.4	13.9	36.8	3.3	94
30-40	50.1	39.3	36.0	2.5	182
>40	49.8	38.1	53.9	9.6	124
Medical qualification					
Medical	50.3	28.9	41.2	2.2	302
Non-medical	59.7	45.5	43.5	13.2	98
Work elsewhere					
Government HF	49.1	36.9	60.4	4.8	61
Other	73.3	19.1	60.9	0.0	13
Nowhere	52.5	32.8	37.5	5.1	325
Proximity					
Proximal	52.6	36.0	37.6	6.6	200
Semi Proximal	50.4	36.1	52.5	3.6	100
Remote	54.9	23.6	39.3	2.7	100
DDA Registration					
Yes	48.7	35.1	40.4	5.1	112
No	57.4	30.3	43.3	4.7	181
Trained on IMNCI/NCP					
Yes	53.0	47.3	43.7	2.6	112
No	52.5	27.4	41.0	5.8	288
Ecological region					
Mountain	60.0	20.0	53.3	6.3	15
Hill	51.7	32.2	38.1	2.5	118
Terai	52.4	34.1	42.5	5.6	267
Total	52.7	32.9	41.8	4.9	400

Likewise, Table 3.19B shows that clinics reported better appropriate follow-up practice (15%) than medicine shops (5%). Appropriate practice was more commonly reported from clinics with providers of 30-40 years age (21%) whereas none of the clinics with younger providers (below 30 years) reported appropriate follow-up practice. Likewise, providers who also worked at the government facility were more common to report appropriate follow-up practice (23%) than their other counterparts (below 12%).

Table 3.19B: Percentage distribution of clinics providing appropriate follow up and counseling practices for sick young infants

	Appropriate minimum schedule	Appropriate advice to parents	Appropriate action for not coming to follow up	Appropriate follow up	Total N
Medical qualification					
MBBS	50.0	66.7	40.5	16.7	42
Pediatrician	41.9	67.7	19.4	6.5	31
Others	44.4	88.9	44.4	33.3	9
Received training on IMCI/IMNCI					
Yes	42.5	72.5	20.0	10.0	40
No	50.0	66.7	45.2	19.0	42
Work elsewhere					
Government HF	51.6	71.0	38.7	22.6	31
Other	44.4	66.7	33.3	11.1	27
Nowhere	41.7	70.8	25.0	8.3	24
Age (years)					
<30	30.8	76.9	23.1	0.0	13
30-40	52.1	70.8	37.5	20.8	48
>40	42.9	61.9	28.6	9.5	21
Total	46.3	69.5	32.9	14.6	82

3.6 Availability of Equipment and Reference Materials for Management of Sick Young Infants

The majority of shops had functional stethoscopes, digital thermometers, cell phones and a timer/watch. However, only 9% of medicine shops had salter scales and 5% had pan scales. Likewise, most clinics (>90%) had functioning adult scales, digital thermometers, stethoscopes, timer/watch, and cell phones; while less had pan and salter scales (52% and 17%, respectively).

Table 3.20: Availability of Functional Equipment and Reference Materials for Management of Sick Young Infants

Variables	Medicine shops				Clinics %
	Mountain %	Hill %	Terai %	Total	
Equipment available and functional					
Salter scale	9.2	4.6	10.9	9.0	17.1
Pan scale	6.6	6.4	4.0	4.8	52.4
Other infant scale	0.0	0.0	1.9	1.3	2.4
Adult scale	64.9	76.8	72.7	73.6	95.1
Thermometer (digital)	89.4	93.1	94.2	93.7	97.6
Thermometer (other)	48.5	56.8	57.5	57.0	56.1
Stethoscope	100.0	100.0	95.1	96.7	100.0

Variables	Medicine shops				Clinics %
	Mountain %	Hill %	Terai %	Total	
Pulse oximeter	14.0	15.2	16.5	16.0	75.6
Timer/watch for counting respiratory rate	86.5	91.8	82.1	85.1	98.8
Cell phone	100.0	99.6	90.6	93.6	100.0
Reference materials/job aids and other support materials available					
IMNCI treatment guideline	36.6	23.7	25.2	25.2	50.0
CIMS	46.3	43.7	41.4	42.3	40.2
MIMS	14.2	5.5	8.1	7.5	8.5
Course books	7.4	17.1	3.7	7.8	24.4
Internet	8.8	1.2	11.7	8.5	-
Medicine and pharmacy books	13.7	12.7	8.5	9.9	-
Other reference materials	12.1	3.6	5.3	5.1	12.2
Register for recording sick child	16.5	22.1	7.3	12.0	57.3
Total (N)	15	118	267	400	82

Percentage may add up to more than 100 because of multiple responses

CIMS was available in 42% of medicine shops and 40% of clinics, and IMNCI guidelines were available in 25% of medicine shops and 50% of the clinics. Only 12% of shops compared to 57% had a register for recording a sick child.

In Table 3.21, useable[14] ORS sachets, paracetamol, and amoxicillin syrup/suspension were widely available (>90%) in medicine shops. The availability of zinc in mountain region was relatively lower (43%) compared to to other regions (>70%). Intravenous fluids and intravenous lines were available in more than 90% of medicine shops in all mountain and hill regions. Injectable gentamicin and ampicillin, which are the IMNCI recommended injectable antibiotics, were available in only 40% and 24% of medicine shops respectively. The availability of injectable gentamicin was higher in hill (51%) and mountain (47%) districts than in terai (34%).

Table 3.21: Percentage distribution of medicine shops by their availability of medicines and other treatment materials for management of sick young infants

Variables	Medicine shops			
	Mountain	Hill	Terai	Total
Medicines and other treatment materials available				
ORS sachets	87.9	97.9	99.1	98.3
Zinc tablets	42.5	72.2	76.5	73.9
Paracetamol	100.0	100.0	99.6	99.7
Amoxicillin syrup/suspension	93.9	99.1	96.3	97.0
Amoxicillin dispersible pediatric-dosed tablets	71.8	77.4	73.1	74.3
Amoxicillin tablets/ capsules – 250 mg (non-dispersible)	52.8	77.9	70.5	72.0
Cotrimoxazole syrup/suspension or dispersible pediatric-dosed tablets	49.0	55.6	62.0	59.6
Amox-clavulanate tablets (or suspension)	53.4	75.9	80.4	78.0

[14] Useable is defined as prior to the expiration date and in appropriate packaging (for drugs) or in working condition (for equipment).

Variables	Medicine shops			
	Mountain	Hill	Terai	Total
Cefixime tablets (or suspension)	87.3	94.1	93.4	93.4
Gentamicin injection (80 mg/2 cc amps)	46.6	51.4	33.8	39.5
Ampicillin injection	24.5	23.2	24.3	24.0
Cefuroxime injection	19.1	18.5	21.2	20.3
Cefotaxime injection	26.2	33.1	39.4	37.0
Ceftriaxone injection	66.6	57.8	53.0	54.9
Insulin syringe for injectable antibiotics (1 ml)	15.9	12.2	10.7	11.3
Insulin Syringe (0.5 ml)	12.5	12.6	10.7	11.4
IV fluids	94.7	93.5	88.4	90.2
IV line	93.6	92.9	88.4	89.9
Total (N)	15	118	267	400

4. Management of Diarrhea and Respiratory Infection for Children Aged 2-59 Months

This section summarizes data from all service providers (N=501) who were approached for the study and consented to be interviewed irrespective of their involvement in providing treatment (n=400) or dispensing antibiotics to infants aged 0-2 months in past six months. While the study focused on children under two months of age, we took the opportunity to understand the practices of providers in delivering services related acute respiratory infection (ARI) and diarrhea to children under five years of age. Thus, before screening related to management of sick young infants, we requested provider consent to interview on ARI and diarrhea management.

4.1 Management of Diarrhea for Children Aged 2-59

Just under 90% of the medicine shops both managed cases and provided treatment for diarrhea among children of 2-59 months (Table 4.1). While 91% of the shops who reported treating diarrhea said they used ORS most of the time or always, only 66% used zinc most of the time or always. Use of antibiotics was high, with nine in ten service providers reporting use of antibiotics sometimes to treat diarrhea among children of 2-59 months. At clinics, nearly all physicians used ORS and 90% of them reported using zinc "most of the time." When asked about antibiotics, the majority of physicians (94%) said they use it 'sometimes' and 4% reported use "most of the time."

The most commonly used antibiotic for non-bloody diarrhea was metronidazole or a combination including metronidazole (57% shop, 48% clinic). For bloody diarrhea, metronidazole was again the most frequently dispensed antibiotic at medicine shops (27%), while clinics mostly used cefotaxime (44%). IMNCI guidelines recommend ciprofloxacin for the treatment of bloody diarrhea, but it was reportedly used by very few service providers in shops or clinics.

Appropriate treatment practice of diarrhea among children of 2-59 months was assessed using three main indicators: 1) use of ORS and zinc most of the time; 2) no use of antibiotics for treating non-bloody diarrhea; and 3) use of ciprofloxacin for treating bloody diarrhea. A mere 2% of medicine shop providers followed all three practices, and adherence was low across all strata (1% remote, 2% proximal, and 4% semi-proximal). Only one clinic followed appropriate treatment practices for diarrhea (Table 4.1). This is largely because the use of ciprofloxacin is not commonly in practice and service providers in most cases used other antibiotics like metronidazole, cotrim, and cefotaxime to treat bloody diarrhea.

Table 4.1: Usual Practice of Management of Diarrhea for Children Aged 2-59 Months in Private Medicine Shops and Clinics that were approached and screened for the survey

Characteristics	Medicine Shops				Clinics %
	Proximal	Semi-Proximal	Remote	Total	
Action taken for children with diarrhea					
Only dispense drugs	18.3	1.8	4.6	11.6	-
Provide Treatment services	0.4	0.0	0.0	0.2	-
Both dispense and treat	79.2	98.2	95.4	87.0	-
Referral only	2.2	0.0	0.0	1.2	-
Total	279	114	108	501	-

Characteristics	Medicine Shops				Clinics %
	Proximal	Semi-Proximal	Remote	Total	
Provision of ORS					
Most/all the time	93.2	89.3	88.3	91.1	97.7
Some times	6.8	10.7	9.7	8.5	2.3
Not at all	0.0	0.0	1.9	0.5	-
Provision of zinc					
Most/all of the time	68.5	60.7	67.0	66.1	89.5
Sometimes	22.5	24.1	13.6	20.8	9.3
Not at all	9.0	15.2	19.4	13.0	1.2
Provision of antibiotics					
Most/all of the time	5.4	6.3	4.9	5.5	3.5
Sometimes	90.1	92.0	88.3	90.2	94.2
Not at all	4.5	1.8	6.8	4.3	2.3
Prescribe antibiotics for non-bloody diarrhea					
Do not provide antibiotics	24.8	23.2	22.3	23.8	30.2
Metronidazole or combination including Metronidazole	54.5	64.3	53.4	56.8	47.7
Amoxicillin	0.9	0.0	2.9	1.1	1.2
Cotrim	9.0	0.9	7.8	6.6	3.5
Cefixime	2.7	3.6	1.9	2.7	9.3
Cefpodoxime	0.0	0.0	0.0	0.0	2.3
Norfloxacin	5.9	5.4	5.8	5.7	1.2
Ofloxacin	1.8	0.0	4.9	2.1	0.01.2
Others	0.5	2.7	1.0	1.1	3.5
Prescribe antibiotics for bloody diarrhea					
Do not provide antibiotics	2.3	0.0	1.0	1.4	0.0
Metronidazole	25.7	27.7	29.1	27.0	31.4
Cefixime	13.5	9.8	9.7	11.7	3.5
Cotrim	22.1	17.9	23.3	21.3	10.5
Cefotaxime	0.5	0.0	1.0	0.5	33.7
Cefpodoxime	2.3	0.9	0.0	1.4	1.2
Ciprofloxacin	5.0	3.6	5.8	4.8	2.3
Ofloxacin	11.7	11.6	11.7	11.7	7.0
Norfloxacin	12.6	25.0	14.6	16.2	7.0
Others	4.5	3.6	3.9	4.1	3.5
Total (N)[1]	222	112	103	437	86
Summary indicator					
Appropriate treatment for diarrhea [2]	1.9	3.8	1.0	2.1	1.2

Percentage may add up to more than 100 because of multiple responses. No data or (-) denote that these questions were not asked to clinics

1 Questions on management of diarrhea were asked to all the medicine shops selected for the survey irrespective of whether they provide the treatment/dispensing services to sick young infants in last 6 months. Data presented in the Table is unweighted and N represents those medicine shops that consented to the interview, treated or dispensed treatment for diarrhea among children of 2-59 months.

2 Appropriate treatments for diarrhea includes providing ORS and Zinc most of the times, not providing antibiotic to treat non-bloody diarrhea and treating bloody diarrhea with IMNCI recommended Ciprofloxacin.

4.2 Management of ARI for Children Aged 2-59

The majority of medicine shops (86%) both dispensed medicine and provided treatment to children with ARI. Appropriate practice of treating ARI among children aged 2-59 months was assessed using two indicators: 1) assessment of respiratory rate and proper physical examination including chest in-drawing to ensure the case of respiratory infection or pneumonia; and 2) providing amoxicillin to treat the infection. Overall, 53% of providers at medicine shops and 43% of providers at clinics reported practicing both of these measures. Comparatively fewer shops at proximal sites (48%) were practicing appropriate treatment practices than at remote (60%) or semi-proximal sites (55%) (Table 4.2).

Table 4.2: Management of ARI for Children Aged 2-59 Months in Medicine Shops and clinics approached and screened for the survey

	Medicine Shops				Clinics %
	Proximal	Semi-Proximal	Remote	Total	
Respiratory infection treatment practices[1]					
Dispensing drugs	18.3	4.4	4.6	12.2	-
Treatment services	0.0	0.9	0.0	0.2	-
Both dispense and treat	78.9	94.7	94.4	85.8	-
Referral only	2.9	0.0	0.9	1.8	-
Total (N)1	279	114	108	501	-
Decision on using antibiotic #					
Treat all with antibiotic	0.5	1.8	1.0	0.9	3.5
Based on respiratory rate (fast breathing)	96.8	99.1	98.0	97.7	97.7
Fever	93.2	89.9	90.2	91.6	96.5
Physical examination-including use of stethoscope listening to the chest, chest-in-drawing	89.5	87.2	83.3	87.5	90.7
General condition	17.7	29.4	13.7	19.7	32.6
Cough	10.0	8.3	12.7	10.2	10.5
Others	6.8	6.4	8.8	7.2	9.3
Antibiotic used most often for treating respiratory infections or pneumonia in infants or young children					
Amoxicillin	61.8	57.8	64.7	61.5	43.0
Cefixime	16.8	22.9	15.7	18.1	11.6
Amox-clavulanate	7.7	10.1	4.9	7.7	22.1
Cotrim	7.7	4.6	7.8	7.0	2.3
Cefotaxime	0.5	0.9	1.0	0.7	4.7
Cefpodoxime	2.3	2.8	1.0	2.1	5.8
Azithromycin	0.0	0.0	0.0	0.0	7.0
Other	3.2	0.9	4.9	3.0	3.5
Most common formulation of antibiotics used					
Oral tablets/ capsules	0.0	3.7	2.0	1.4	1.2
Dispersible tablets	1.4	0.9	3.9	1.9	1.2
Syrup/ suspension	98.2	95.4	93.1	96.3	95.3

	Medicine Shops				Clinics %
	Proximal	Semi-Proximal	Remote	Total	
Injections	0.5	0.0	1.0	0.5	3.5
Total (N)	220	109	102	4312	861
Appropriate treatment for respiratory infection3	48.4	55.3	60.2	52.5	43.0

Multiple responses. No data or (-) denote that these questions were not asked to clinics

1 Questions on management of respiratory infections were asked to all the medicine shops selected for the survey irrespective of whether they provide the treatment/dispensing services to sick young infants in last 6 months. Data presented in the Table is unweighted and N represents those medicine shops that consented to the interview, treated or dispensed treatment for respiratory problem among children of 2-59 months.

2 Medicine shops who provide treatment services during respiratory infection

3 Appropriate treatment for respiratory infection includes assessment of respiratory rate and physical examination and use of Amoxicillin (IMNCI recommended) for respiratory infection.

The majority of service providers in medicine shops as well as clinics said they used antibiotics if they saw signs of fast breathing, fever and/or chest in-drawing. Only a fraction of providers reported use of antibiotics based on general condition of the children, while very few (1%) treated every child for treatment of pneumonia with an antibiotic. Amoxicillin, recommended by IMNCI guidelines, was the most commonly used antibiotic, followed by cefixime in shops and amox-culavulanate in clinics. Syrup/suspension was the most common formulation of antibiotics used for children by shops, while clinics reported use of dispersible tablets (95%) most of the time.

5. Summary of Findings and Implications

5.1 Profile of private shops and clinics

- There were very few (11%) clinics run by physicians seeing sick young children outside of urban areas, reinforcing the importance of the medicine-shop sub-sector for ensuring access for peripheral and remote populations.
- A high proportion of medicine shops were staffed by qualified paramedics (84%): almost 70% by a certified medical assistant (CMA) or health assistant (HA), and 8% by a qualified pharmacy assistant. The majority (86%) of these staff were male (as were 98% of clinic-based physicians seeing sick young infants), and 70% of these paramedics had more than 5 years of experience (vs. 51% of the physicians).
- Forty-five percent of medicine shops in the study sample were not registered with the Department of Drug Administration (DDA); in peripheral/remote areas, the proportion was much higher. Furthermore, they are the main source of services in peripheral and remote areas and should be brought into the system and encouraged to register.
- Almost all medicine shops (95%) reported being open 7 days/week; over three-quarters reported being open at least 11 hours/day. *This confirms findings of the six-district study and earlier care-seeking studies that this sub-sector provides easily available services, making them an important resource to the community and worthy of efforts to improve quality of care.*
- About 15% of medicine shop providers reported also working in public-sector health facilities. The percentage was higher among clinic physicians: 34% reported working in public-sector health facilities and 33% reported work in other private-sector hospitals or clinics. *Findings confirm that dual practice is certainly present (especially for physicians), but most medicine shop providers are not also working in the public sector.*
- Participation in integrated management of childhood illness (IMNCI) training was reported by 27% of those in medicine shops and 49% of physicians. *There has been some IMNCI exposure within the private sector, and from the six-district study, we know that these providers consider the MoHP to be a highly credible source for clinical practice guidelines, suggesting an opportunity for further engagement.*

5.2 Assessment and treatment of sick young infants below the age of 2 months

- Most medicine shops reported providing treatment services to sick young infants 0-2 months that involved more than just dispensing medicines: 86% reported also assessing and making treatment decisions. *Non-physician providers based in medicine shops (mainly HAs and CMAs) may be playing a role that exceeds what they are formally permitted.*
- Caseloads were variable and the higher caseloads were concentrated among a relatively small number of providers across both medicine shops and clinics. For example, although the mean number of young infants seen in the previous six months by medicine shops was 53, 56% of shops reported having seen fewer than 20 patients. The volume of sick young infants managed at outpatient level by physicians was about twice that of medicine shops (mean of 105 cases), and two-thirds treated 20 or more cases in the last six months. *This suggests that strategies aiming for impact should concentrate particularly on higher volume providers.*
- The volume of cases under 1 month old treated at private medicine shops was considerably lower than for patients under 2 months, with a mean of 17 cases reported for medicine shops and 41 for clinics. This indicates that the majority of sick young infants seen in medicine shops and clinics were aged between four and eight weeks.
- While both physician run clinics and medicine shop providers reported use of reference materials for assessment, the pattern of use differed: physicians were considerably more likely to report use of IMNCI manuals (46% vs 16% for medicine shops providers), internet (28% vs 12%), and somewhat more likely to report using course books (49% vs 36%). Both physicians and medicine shop providers also reported

using Current Index Medical Specialties (CIMS) (28% and 37%, respectively). Medicine shops providers in remote clusters were least likely to report using IMNCI manuals, CIMS or internet and more than a quarter (28%) did not use any reference materials. *As documented in the six-district study, it appears that medicine shop providers particularly value clinical guidelines developed by MoHP.*

- In assessing sick young infants for classification and for severity of illness, 80-90% of providers at medicine shops and clinics reported routinely checking temperature, respiratory rate, and breathing sounds. Physicians were more likely than medicine shop providers to report checking for feeding problems, jaundice, chest in-drawing, oxygen saturation, level of consciousness, and umbilical infection. *Making job-aids and other clinical assessment tools available to medicine shop providers along with proper training could help improve quality of assessment/classification.*
- Treatments reported to have been given over the past six months for infants under 2 months included oral antibiotics (99% of medicine shops, 94% of clinics), injectable antibiotics (20% of medicine shops and 46% of clinics), bronchodilators (43% for both medicine shops and clinics), and injectable steroids (11% of shops and 21% of clinics). The usual first-line oral antibiotic was reported to be amoxicillin by 62% of medicine shops and 65% of physicians. Cefixime use was also commonly reported (35% of medicine shops, 39% of physicians). Drops were the most commonly used formulation of antibiotic for this age group (66% of medicine shops, 77% of physicians); oral suspensions were also used but virtually no reported use of dispersible tablets. *Shops and clinics are in general providing amoxicillin as first-line treatment for infants 0-2 months as recommended, but efforts should be made to reinforce this practice, to minimize use of other non-recommended treatments.*
- Twenty percent of medicine shops reported use of injectable antibiotics for treating sick young infants under 2 months in the past six months; compared to 46% of physicians.. *The sub-group of providers at medicine shops already treating sick young infants with injectable antibiotics should be prioritized in efforts to improve quality and timeliness of PSBI care in this sub-sector.*
- Incorrect dosing was common for both oral and injectable antibiotics in medicine shops and clinics. This is a threat, both with regard to treatment effectiveness and safety. Part of the problem was failure to base dose on weight (36% of medicine shops and 10% of physicians reporting using age rather than weight).
- Even among those determining dose by weight, inaccurate weighing procedures were common, particularly in medicine shops. Most clinics (63%) reported using either a Salter or pan scale, although when doing so, 80% did not remove the baby's coverings to take the weight. Few medicine shops had Salter or pan scales available; rather most shops (79%) reported determining weight by having the mother stand on an adult scale, with and without the baby, and subtracting to determine the baby's weight. This inaccurate procedure was also commonly reported in clinics (37%). Among medicine shops, 11% reported just estimating the baby's weight by eye. *Accurate dosing, including proper weighing equipment and procedures, needs to be prioritized to help ensure treatment effectiveness and safety.*
- About 20% of physicians and 11% of medicine shop practitioners reported ever using injectable steroids for treating sick young infants, most often "when the child has signs of critical illness." *In almost all such cases, this is inappropriate and likely to increase the risk of death. This should be a priority area for MoHP, NePAS, and others to take action to address.*
- Drug availability for treating sick young infants below 2 months was variable in medicine shops: there was almost universal availability of amoxicillin or amox/clavulanate in suitable pediatric formulations. Cefixime was widely available (93%). The most widely available injectable antibiotic was ceftriaxone (55%). Gentamicin (80mg/2cc) was available in 40% of medicine shops.

5.3 Referral and follow-up of sick young infants 0-2 months

- In general, both medicine shop providers and physicians reported appropriate criteria for determining a need for hospital referral, although physicians were more likely than medicine shop providers to report considering: low weight (<1500g), bulging fontanelle, central cyanosis, and failure to improve. Approximately half of both medicine shop providers and physicians reported routinely giving a pre-referral dose of oral antibiotics for such cases. Use of pre-referral injectable antibiotics for such cases was reported considerably less often (8% of medicine shops, 13% of physicians). Overall, none of the medicine shops performed all recommended pre-referral activities: correct indication of severe illness; facilitation of referral; and appropriate pre-referral injectable. Nearly three-fourths of the medicine shops reported facilitating the referral process. *Strengthening referral practices in the private sector, including with appropriate public sector facilities, should be a priority to improve overall quality of care, particularly for the most serious cases.*
- Appropriate follow-up practice consists of following up non-referred sick young infants on the third and fifth days, providing appropriate advice to parents or guardians before starting the treatment, and following up on infants who do not return for treatment as expected. About one-half of service providers said that they meet non-referred infants for follow-up on third and fifth days. Nearly one-third of the medicine shops provided adequate information to the parents/guardians regarding antibiotic use while starting the treatment. This was reported lower in the younger age group and among untrained IMNCI providers. Moreover, most medicine shop providers did not adhere to the practice of inquiring about infants who do not return for follow-up as expected. Overall, very few of the medicine shop providers (5%) practiced all appropriate measures of follow-up and counseling. *Approaches for improving follow-up of sick young infants under treatment in the private sector, particularly those who do not return for follow-up as expected should be developed and tested.*

5.4 Factors that influence provider practices in the management of sick young infants 0-2 months

The study assessed the influence of the following factors on provider practices: strata reflecting proximity to hospital (for shops only), provider age, medical qualifications, whether provider worked elsewhere, DDA registration status (shops only), and training in IMNCI/CBNCP. Overall influence of these factors was quite mixed. Further analysis will be done in the future to better identify and analyze trends and implications.

- *Strata*: Medicine shop providers in remote clusters, in comparison with other clusters, less commonly adhered to appropriate assessment practices, but often offered appropriate injectable and oral antibiotic treatment services. These providers were the least likely to correctly identify signs for referral or to facilitate referral.
- *Provider age*: Nearly half (49%) of providers over the age of 40 did not correctly identify indications for injectable antibiotics, whereas 63% below 30 years of age did correctly identify those indications. Likewise, among medicine shops, steroid-use for treatment was reported by 38% of providers less than 30 years of age, which was 27% points lower than the providers more than 40 years of age.
- *Medical qualifications*: Medical shop providers with formal medical qualifications, compared to other medicine shop providers, almost always performed better with regards to assessment and treatment practices. However, only 2% of providers with formal medical qualifications reported to perform appropriate follow-up, compared to 13% of providers with non-medical qualifications.
- *Provider employment elsewhere*: A higher proportion of the providers (49%) that also worked at government facilities reported to adhere to the appropriate assessment practice than their counterparts (<8%).
- *Registration status*: Overall, provider practices did not vary greatly based on whether the medicine shop was registered with DDA or not.
- *Training in IMNCI/CBNCP*: It was more common for providers that received training in IMNCI/CBNCP to follow appropriate assessment practices, and to follow most practices related to giving injectable antibiotics. However, determination of appropriate dose, frequency, and duration of injectable antibiotics, and using amoxicillin as a first-line oral antibiotic were less common in this group.

5.5 Treatment of diarrhea and ARI in young children

- Most medicine shops were doing more than dispensing treatments for diarrhea, as 87% reported assessing and making treatment decisions. *For ORS and zinc—as non-prescription drugs—this is within their legally permitted scope of practice.*
- Zinc was available in about three-quarters of medicine shops in hill and terai districts but only 43% of shops in mountain districts. ORS was available in essentially all medicine shops in hill and terai districts, and in 88% of medicine shops in mountain districts. Similarly amoxicillin syrup/suspension was available in almost all shops and in dispersible tablet form in 74% of shops. Cotrim suspension or dispersible tablets were somewhat less widely available. *Poor availability of zinc in private shops in mountain districts is a problem requiring attention.*
- Overall, the likelihood of appropriate treatment for child diarrhea was somewhat higher in physician-run clinics than in medicine shops. Among clinics, 98% reported prescribing ORS most or all of the time (vs 91% of medicine shops) and 90% reported such use of zinc (vs 66% of medicine shops). Only 4% of physician-run clinics reported using antibiotics for most or all diarrhea cases (vs 6% of medicine shops). *This suggests that in general service providers understand what constitutes proper diarrhea management. However, there remains room for improvement, particularly among medicine shop practitioners.*
- When antibiotics were dispensed for non-bloody diarrhea cases, generally metronidazole was used. For bloody diarrhea, first-line treatments were cited as metronidazole (27% of medicine shops, 31% of clinics), fluoroquinolone antibiotics by about one-third of medicine shops (in line with IMNCI guidelines) and 16% of clinics, and cefotaxime by one-third (34%) of clinics. *Usual care practices for antibiotic treatment of non-bloody and bloody diarrhea in the private sector are inappropriate. The MoHP, NePAS, and others should work with the pharmacological sector to ensure appropriate first-line treatment of diarrhea.*
- For ARI, the overwhelming majority of medicine shops (86%) reported not just dispensing treatment but also assessing and making treatment decisions. Among peripheral and remotely located medicine shops, about 95% reported making treatment decisions. *Note that since this entails use of antibiotics, this practice lies outside the formally recognized scope of practice for non-physicians working in the private sector. Nevertheless, as the main source of child ARI care in the country, the medicine shop sub-sector is serving a valuable social role. MoHP, NePAS, DDA, and others should find ways of more formally recognizing such practice and ensuring adherence to clinical guidelines.*
- Virtually all providers reported using respiratory rate to classify ARI cases for treatment, in line with national protocols. Amoxicillin (with or without Clavulanic acid) was reported as first-line treatment by roughly two-thirds of providers in medicine shops (69%) and clinics (65%). Cefixime was the second most likely to be reported for use as first-line (18% of medicine shops, 12% of clinics). Overwhelmingly, providers reported using syrup/suspension formulations for treating young children (96%), not dispersible tablets. *Since amoxicillin is the first-line treatment recommended under CB-IMNCI, it is good news to see this is the most commonly used treatment. Cefixime is not the recommended first-line drug, but is also an efficacious treatment for ARI. Efforts could be made to improve access to dispersible formulations in the private sector.*

Recommendations

A large proportion of private sector providers are caring for sick young infants, hence an urgent need for interventions aimed at improving quality of care in the private sector. Considering the fact that most of the medicine shops are providing treatment services to sick young infants, there is an urgent need for interventions aimed at improving quality of care in the private sector, and more emphasis should be placed on recognizing danger signs in young infants to ensure immediate referral is made with proper facilitation. The following recommendations are intended for a consortium of national-level partners, from across the non-profit, government, and private sectors.

System strengthening

- ***Strengthen systems at the central- and provincial-levels, as appropriate, to improve quality of care. To do so, a multi-partner effort, importantly leveraging corporate support, is needed to increase the safety and quality of care for sick young infants by private providers.*** This may include restructuring government oversight, certification, and enforcement mechanisms related to private providers. In addition, advocacy to provincial-level officials to sensitize them on the role of private sector providers within their districts may be needed during the transition to federalism. The study identified several performance gaps that should be prioritized:
    - inaccurate weighing and dosing of sick young infants
    - potentially dangerous practices, particularly use of corticosteroids for treating sick young infants
    - limited use of pre-referral injectable antibiotics and weak adherence to all appropriate referral facilitation acts
- ***Facilitate registration of medicine shops.*** Around 45% of the medicine shops were unregistered under DDA, which makes it difficult to monitor their practices or include them in formal awareness or quality improvement initiatives. Collaborative efforts among CHD, DDA and the public health offices or public health units at *Paalika level* are needed to design an approach that would facilitate registration of medicine shops that are providing basic care to the community.
- ***Actively engage the pharmacological sector.*** Most critically, the MoHP, NePAS, and others should work with the pharmacological sector to ensure appropriate first-line treatment of diarrhea and availability of zinc. The sector should also support with providing appropriate equipment to the private sector, particularly weighing equipment to medicine shops.

Research

- ***Carry out exploratory work to design and test sustainable and scalable strategies to enable and empower private providers to deliver quality care.*** Strategies should avoid intensive training and expensive ongoing project inputs and instead employ a mix of light on-site coaching (perhaps modeled somewhat on private sector pharma detailing), at-a-distance support by phone, and job-aids. Pre-service training of paramedics should also be explored in collaboration with academic institutions. As practices were seen to differ between strata, approaches may need to be tailored to address specific needs of providers in remote areas as compared to needs in proximal or semi-proximal areas.
- ***Conduct further research to better understand commodities and supply chains for private providers***. While many key medicines required to treat PSBI were readily available from sample sites, other drugs and supplies were quite varied. In addition, changes in policies may hamper the provision of quality of care if providers are unable to ensure procurement and availability of commodities and future disruptions to the health system may weaken procurement chains. Ensure that commodities and supply chains are strengthened and consider how best to track availability of drugs and commodities within the sector.

- ***Consider care-seeking practices and behavior-change strategies for sick infants below four weeks of age.*** The majority of sick young infants seen in medicine shops and clinics were aged between four and eight weeks, suggesting that children with suspected neonatal sepsis are not seeking timely care or are seeking care from the private sector. As one of the leading causes of newborn deaths in Nepal, more effort must be placed on reaching these children and families.

Training

- ***Deliver trainings to private providers.*** Overall, medicine shops are largely operated by paramedics, many of which have not been trained on IMNCI protocols. Therefore, many are managing sick young infants with limited knowledge and skills. Orientation of private sector providers on the national IMNCI guidelines may improve existing service delivery, and emphasis should be placed on danger signs for critical illness.
- ***Promote access to and use of relevant clinical protocols and job aids.*** As documented in the six-district study and found in this survey, medicine shop providers value clinical guidelines developed by the MOHP. The CHD can be a resource center by ensuring relevant clinical protocols are available on its website and encourage pharmaceutical companies and others to help publicize availability of national treatment protocols and other job aids.
- ***Re-examine provider qualifications and responsibilities***. Non-physician providers based in medicine shops (mainly HAs and CMAs) may be playing a role that exceeds what they are formally permitted. Explore how to formalize and regulate provision of care, or consider revising job descriptions for some providers.

Partnership with public sector

- ***Establish functional mechanisms to facilitate timely and reliable referral/coordination of care for more critically ill cases for care at hospital level.*** Service providers at medicine shops and clinics play an important role in facilitating timely access to treatment at higher-level facilities by calling the receiving institution and arranging transport, particularly for critically ill cases. Strategies to link private providers, particularly those in remote areas, with hospital-based physicians to access case-management advice should be explored, through both traditional means and innovative technology, including digital/mobile technology.
- ***Develop strategies for improving follow-up care for all cases.*** Strengthening relationships between private providers and hospital-based physicians may also improve follow up care and counseling provided. This will see that those families for whom referral is not possible or who face early discharge from a facility are still able to receive complete care for their sick children. This may also limit the risk of antibiotic resistance stemming from an inability to adhere to and complete treatment regimens.

Quality of care

- ***Undertake an approach for improving quality that places strong emphasis on equity and dignity, jointly focusing quality improvement efforts on high-volume providers, while also identifying strategies to improve care for underserved populations.*** The volume of sick young infants managed by medicine shops and clinics was highly variable, with a small number of providers managing relatively large volumes. Concentrating initial quality improvement efforts on high-volume providers will contribute to greater impact. It is critical that a strategy also consider care-seekers in remote areas that may have more limited access to higher skilled, higher-volume providers.

To address some of the findings of this survey, MCSP is collaborating with the MoHP to develop and test sustainable and scalable strategies to enable and empower private providers to deliver quality care for improving management of sick young infants, including increasing safety and quality of care, promoting access to and use of clinical protocols, and establishing functional mechanisms to facilitate timely and reliable

referral for more critically ill cases. MCSP and the MoHP are also building a consortium of national-level partners from across the non-profit, government, and private sectors, with whom results will be shared so that services with the potential to reduce the number of newborns and young infants that die as a result of serious bacterial infection are ultimately scaled nationally. Results will enable the Government of Nepal to leverage existing patient demand for sick young infant care in the private sector and improve the quality of those services.

Annex A: Private Medicine Shops that Only Dispense Treatment

Those medicine shops that only dispensed antibiotics treatment for infants 0-2 months in the past 6 months contributed to the total sample of 79 medicine shops with 68 in national survey and 11 in the proposed pilot districts survey. This section presents the unweighted analysis of the total number of these types of shops irrespective of national or proposed pilot districts surveys.

Table B1: Percentage distribution of Medicine Shops by Ecological Zone, Proximity to Hospital and Registration Status

Characteristics	N	%
Ecological Zone		
Mountain	24	30.4
Hill	34	43.0
Terai	21	26.6
Distance from Medicine Shop to Hospital		
Proximal (0-30 minutes from hospital)	65	82.3
Semi-proximal (30-60 minutes from hospital)	8	10.1
Remote (More than 1 hour from hospital)	6	7.6
Registration Status#		
Sangini Outlet	2	2.5
DDA	70	88.6
NCDA	15	19.0
Not Registered	8	10.1
Total (N)	79	*
# multiple responses		

Forty-three percent of the private medicine shops covered by the survey, that only dispense treatment for sick young infants was located in hilly region, 31% in mountain and 27% in Terai. Most of these shops were located in proximal sites (82%). Eighty-nine percent of these medicine shops had DDA registration, while 10% of them were not registered anywhere. Some medicine shops (19%) were registered with Nepal Chemist and Druggist Association (NCDA) (Table B1). The medicine shops who only dispense drugs mostly either get themselves registered with DDA or NCDA and multiple registration is not a very common phenomenon. Eighteen percent of the shops had both DDA and NCDA registration while only one shop each had Sangini plus DDA and Sangini plus NCDA registration (data not shown in Table).

The majority (95%) of the shops operated throughout the week and provided service for 11-15 hours (63%). Ninety percent of the private medicine shops did not have a physician available as service provider. Seven percent of medicine shops reported one or more doctors' visit scheduled for certain number of days in a week. While 11% of medicine shops in remote areas had a visiting physician for certain number of days in a week, the figure was quite low among shops in proximal and semi proximal sites (6% and 5%).

Table B2: Percentage distribution of medicine shops by availability of physician and operating hours

Characteristics	N	%
Operating hours		
Do not operate for 24 hours	73	92.4
Operate for 24 hours	6	7.6
No. of days open per week		
5	1	1.3
6	3	3.8
7	75	94.9
Availability of services per day in hours		
1-5 hrs	3	3.8
6-10 hrs	12	15.2
11-15 hrs	50	63.3
>15 hrs	14	17.7
Availability of another qualified health worker		
Yes	54	68.4
No	25	31.6
Total (N)	79	100.0

Table B3: Percentage distribution of medicine shops by background characteristics of service providers

Characteristics	N	%
Sex		
Male	69	87.3
Female	10	12.7
Age		
19 - 30 years	31	39.2
31 - 40 years	21	26.6
41 - 50 years	15	19.0
51 years or more	12	15.2
Mean (SD)	38 (13.9) years	
Highest medical qualification		
CMA	34	43.0
Pharmacy assistant/Pharmacist	19	24.1
HA	8	10.1
No formal qualification	4	5.1
Nurse	1	1.3
Others	13	16.5
Ever received training on IMCI/IMNCI		
Yes	10	12.7

Characteristics	N	%
No	69	87.3
Ever received training on CBNCP		
Yes	5	6.3
No	74	93.7
Total (N)	79	100.0

Most providers in medicine shops were male (Table B3). The average age of the service providers was 38 years. Forty-three percent of the medicine shops were run by Community Medicine Auxiliary (CMA) graduates, 24% by pharmacists and 10 percent by Health Assistants. Only a small proportion of service providers (5%) had no formal medicine care education. Most of the service providers had not been trained on IMCI/IMNCI guidelines or CBNCP.

Table B4: Percentage distribution of the shops by working experience of service providers

	N	%
Service provider's years of experience dispensing medicine for sick young infants		
< 1 year	5	6.3
1-2 years	8	10.1
>2-5 years	21	26.6
>5-10 years	10	12.7
>10 years	35	44.3
Service provider's years of experience working in sampled medicine shops		
< 1 year	12	15.2
1-2 years	11	13.9
>2-5 years	25	31.6
>5-10 years	12	15.2
>10 years	19	24.1
Service provider's employment at other facility		
Government health facility	9	11.4
Other private health sector facility	2	2.5
Others	1	1.3
Nowhere else	67	84.8
Total (N)	79	100.0

Over two-fifths of the service providers had more than 10 years' experience in dispensing medicine for sick young infants. A small proportion (16%) were quite new with less than 2 years of working experience. Twenty-four percent of the service providers had spent more than 10 years dispensing medicine from the sampled medicine shop while 20% were there for two years or less. The majority of the service providers at the medicine shops did not work elsewhere.

Table B5: Average Number of Sick Infants 0-2 Dispensed Treatments Over the Past 6 months

	N	%
No. of sick infants who were given medicine in past 6 months		
1-10	21	26.6
11-20	13	16.5
21-40	18	22.8
41-100	14	17.7
>100	13	16.5
Mean(SD)	98.2 (65.6)	
No. of 0-1 month who were given medicine in past 6 months		
None	14	17.7
1-5	20	25.3
6-10	17	21.5
11-20	13	16.5
>20	15	19.0
Mean (SD)	18 (29.4)	
No. of 0-2 months who were given oral antibiotics		
None of them	4	5.1
Some of them	41	51.9
Most of them	25	31.6
All of them	9	11.4
Total (N)	79	100.0

The medicine shops on an average reported dispensing drugs to 66 infants 0-2 months in the six months preceding the survey. When asked how many of these young infants belonged to 0-1 month group, 18% of the service providers said that there were none, while 19% said they had dispensed drugs to over 20 of them. On average, the medicine shops had dispensed antibiotic medicines to 18 neonates (0-1 month) in the six years preceding the survey.

When asked how many of the 0-2 months infants that they dispensed drugs for had been given oral antibiotics in the past six months, about half of the service providers answered that they had done so for some of them while about one-third said that most of them had been given oral antibiotics.

Table B6: Percentage distribution of medicine shops by type of antibiotics dispensed for sick young infants

	N	%
Specific oral antibiotic most often dispensed		
Amoxicillin	45	60.0
Cefixime	13	17.3
Azithromycin	5	6.7
Amox-clavulanate	4	5.3
Cotrim	3	4.0
Cefotaxime	1	1.3

	N	%
Others	4	5.3
Dispensed injectable steroids (like dexamethasone in past 6 months for 0-2 months		
None	74	93.7
12	1	1.3
15	1	1.3
20	1	1.3
100	1	1.3
Dispensed injectable antibiotics in past 6 months for 0-2 months		
None	64	81.0
1-10	7	8.9
11-30	3	3.8
>30	5	6.3
Mean(SD)	8 (30.8)	
Total	79	100
No of 0-1 month for whom injectable antibiotic was dispensed (n=15)		
None	4	26.7
2-10	7	46.7
>10	4	26.7
Mean (SD)	12 (24.8)	
Name of antibiotic mostly dispensed for 0-2 months#		
Gentamicin	7	46.7
Ampicillin	7	46.7
Cefotaxime	5	33.3
Ceftriaxone	4	26.7
Cefuroxime	1	6.7
Others	2	13.3
Total	15	*

Multiple response

The most common antibiotic dispensed was amoxicillin (60%), followed by cefixime 17%). The vast majority of providers reported they had not dispensed injectable steroids like dexamethasone in past 6 months for 0-2 months. Likewise, 81% of providers reported they had not dispensed injectable antibiotic to 0-2 months in the past six months. Among those who had dispensed injectable antibiotic in the past six months, the numbers of infants given injectable antibiotics were quite small (Table B6). Gentamicin and ampicillin were the most common injectable antibiotic dispensed (47% each) followed by cefotaxime (33%) among those reporting any use.

Availability of Medicines

The private medicine shops that dispense drugs to sick infants unanimously had paracetamol (100%) available (Table B7). Packets of ORS were observed in 90 percent of the medicine shops while zinc was observed in 66 percent of these shops. Most of the medicine shops had amox-clavulanate tablets and more than half had ceftriaxone injections too. Less than half of the medicine shops that just dispensed treatment for young infants had gentamicin and ampicillin injections in stock.

Table B7: Percentage distribution of medicine shops by availability of medicines/ commodities for management of sick young infants

Medicines/Commodities	N=79	%
Paracetamol	79	100.0
Cefixime tablets	76	96.2
Amoxicillin syrup/suspension or dispersible pediatric dosed tablets	75	94.9
ORS sachets	71	89.9
Amox-clavulanate tablets	62	78.5
Cotrimoxazole syrup/suspension or dispersible pediatric dosed tablets	53	67.1
Zinc tablets	52	65.8
Ceftriaxone injection	50	63.3
Cefotaxime injection	39	49.4
Gentamicin injection	36	45.6
Ampicillin injection	32	40.5
Cefuroxime injection	24	30.4
Insulin Syringe (1.0 ml)	28	35.4
IV fluids	72	91.1
IV line	70	88.6