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A Comparison between the 2015 and 2021 Nepal Health Facility Surveys

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Yogendra Prasai¹
Raj Kumar Sangroula¹
Shireen Assaf²

ICF
Rockville, Maryland, USA

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¹ New ERA, Rudramati Marg, Kalopul, Kathmandu, Nepal

² The DHS Program, ICF

Corresponding author: Yogendra Prasai, New ERA, Rudramati Marg, Kalopul, Kathmandu, Nepal;
phone: +977-1-4513603; email: yp@newera.com.np



New ERA



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ACRONYMS AND ABBREVIATIONS

ANC	antenatal care
BHCCs	basic health care centers
CHU	community health unit
CI	confidence interval
COVID-19	coronavirus disease-19
DHS	Demographic and Health Survey
FCDO	Foreign, Commonwealth, and Development Office
FP	family planning
GoN	Government of Nepal
HF	health facility
HFOMC	health facility operation and management committee
HIV	human immunodeficiency virus
HP	health post
HTCs	HIV testing and counseling centers
HW	health worker
KIR	key indicator report
MMR	maternal mortality ratio
MNH	maternal and newborn health
MoHP	Ministry of Health and Population
NDHS	Nepal Demographic and Health Survey
NHFS	Nepal Health Facility Survey
NHRC	Nepal Health Research Council
NHSS	Nepal Health Sector Strategy
NPC	National Planning Commission
NSO	National Statistics Office
PHCCs	primary health care centers
PNC	postnatal care
SARA	Service Availability and Readiness Assessment
SDG	Sustainable Development Goal
UHC	urban health center
USA	United States of America
WHO	World Health Organization

ABSTRACT

This study assessed service availability, service readiness of (antenatal care) ANC and delivery services, as well as the process of care, infection prevention and control, and client satisfaction of ANC services from two Nepal Health Facility Surveys.^{1,2} We used a simple additive index that produced scores by adding binary variables. The scores for service readiness, infection prevention and control, and adherence to the process of care, as well as client satisfaction and their background characteristics, were compared to determine any significant differences.

The analysis revealed that the service availability for ANC for 5 days or more in a week and the service readiness for infection prevention and control for ANC and delivery services have significantly increased over the years. The overall service readiness score for ANC has significantly increased by 5% with the greatest increase in primary health care centers (PHCCs) and basic health care centers (BHCCs), across all ecological regions, and in Koshi, Madhesh, Bagmati, and Sudurpaschim provinces. The overall service readiness score for delivery services has significantly increased by 6% between 2015 and 2021. This increase was also found in PHCCs and BHCCs, with large increases found in Karnali and Koshi provinces. There was no significant change in the adherence to the process of care in ANC services between the two surveys. Trends in adherence to the process of care could not be examined for delivery services because of the lack of observation data in the 2015 survey. Client satisfaction with delivery services could not be specifically measured. Client satisfaction related to ANC increased significantly in 2021 compared to 2015.

The report highlights areas of required intervention for the further improvement of ANC and delivery services in Nepal.

Key words: antenatal care, labor and delivery services, Nepal Health Facility Surveys

KEY FINDINGS

Change in key indicators of family planning services

Indicators	2015 (%)	2021 (%)	% change	p value
Health facilities that provide ANC services 5 or more days in a week	85.0	96.5	11.5	***
Availability of delivery services	48.7	51.4	2.7	NS
Service readiness score for ANC services	57.5	62.5	5.0	***
Guidelines and trained staff	25.3	19.7	-5.6	*
Equipment	89.9	95.0	5.1	**
Testing capacity	14.4	27.1	12.7	**
Medicines	73.0	77.9	4.9	**
Service readiness score for delivery services	66.4	72.1	5.7	***
Guidelines and trained staff	29.0	21.2	-7.8	**
Supplies and equipment	70.6	79.3	8.7	***
Testing capacity	80.2	83.8	3.6	NS
Infection prevention and control readiness score for ANC services	33.1	63.4	30.3	***
Infection prevention and control readiness score for delivery services	44.8	68.8	20.0	***
Adherence to the process of care score for ANC services	32.5	30.4	-2.1	NS
Client history	19.0	17.9	-1.1	NS
Physical examination	60.5	53.4	-7.1	**
Test	34.8	42.2	7.4	*
Counseling/prescribing medicines	25.7	29.1	3.4	*
Client satisfaction score for ANC	86.4	89.2	2.8	**

* $p < .05$, ** $p < .01$, *** $p < .001$; NS = not significant

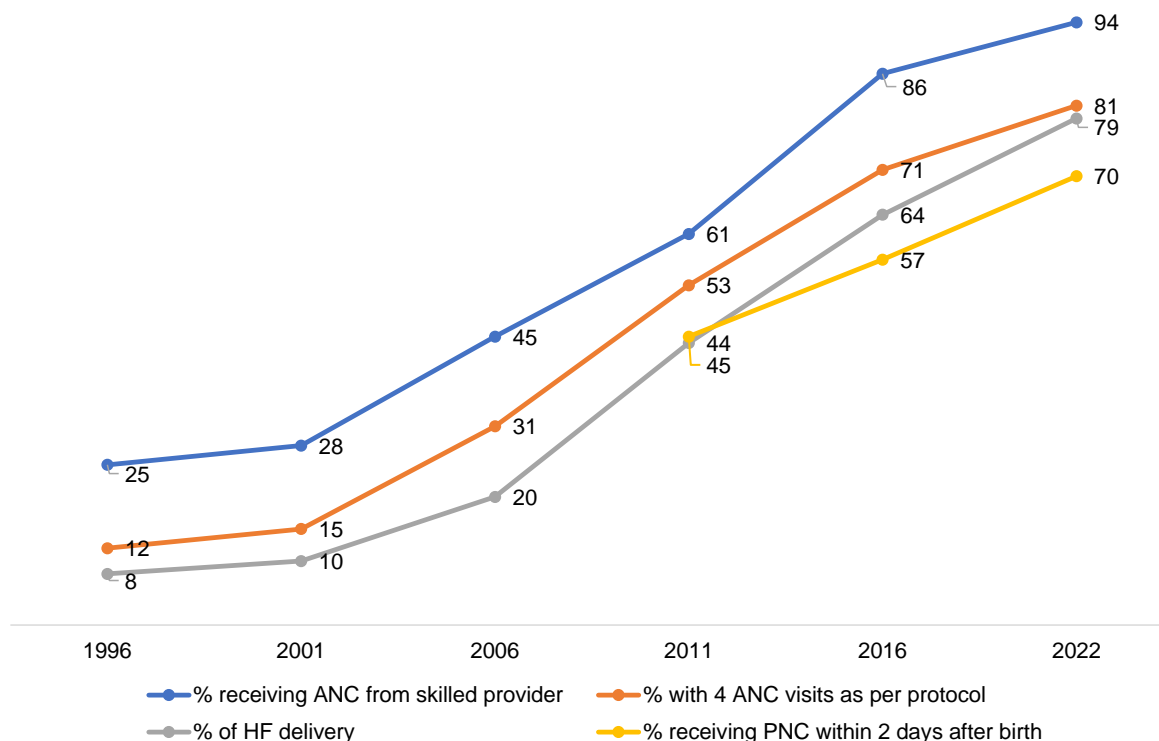
1 INTRODUCTION

Nepal has made tremendous progress in maternal health in the past two decades. Despite a range of challenges, the country is showing dramatic progress in the health sector.³ Proper care during pregnancy and delivery, and the postpartum/postnatal period is essential for the health of women and newborns.

1.1 Maternal Health Status in Nepal

Women who gave birth in the 2 years before the survey and received antenatal care (ANC) service from a skilled provider (doctor/nurse and auxiliary nurse midwife) increased sharply from 25% in 1996 to 94% in 2022 (Figure 1). The percentage of women with four or more ANC visits in Nepal for the 2 years before the survey has increased from 12% in 1996 to 81% in 2022, while the percentage of women delivering at a health facility increased from 8% in 1996 to 79% in 2022.⁴ For postnatal care (PNC), 70% of women received a postnatal check within 2 days of giving birth in 2022, while in 2011, only 45% received the postnatal check. Overall, Nepal has improved maternal health services and reduced the maternal mortality ratio (MMR) by 52% over the last two decades between 1996 and 2016, from 539 to 259 deaths per 100,000 live births.⁵ According to the 2021 Nepal Maternal Mortality Study, the MMR has reduced further to 151 per 100,000 live births.⁶

Figure 1 Trends of key maternal health indicators



ANC = antenatal care, HF = health facility, PNC = postnatal care

Nepal is committed to achieving Sustainable Development Goal (SDG) 3.1 of reducing the MMR to less than 70 per 100,000 live births by 2030. Nepal's targets for attending four ANC visits, health facility delivery, and three PNC visits as per protocol are 90% by 2030.⁷ According to the NDHS 2022, Nepal is close to meeting the ANC and the health facility delivery SDG targets. Information on the total number of PNC visits by women is not collected in the NDHS, however, only 70% of women had their first PNC visit within 2 days of delivery.

Table 1 **SDG 3.1 indicators and targets**

Indicators	Targets by 2030
MMR	70/100,000 live births
Four ANC visits per protocol	90%
Institutional delivery	90%
Three PNCs as per protocol	90%

MMR = maternal mortality ratio, ANC = antenatal care, PNC = postnatal care

1.2 Objectives

This report is focused on changes in service availability, service readiness, the process of care, and client satisfaction of maternal health services provided by the public and private health facilities in Nepal. The report uses “maternal health services” to mean ANC and delivery, although post-natal care is also an important part of maternal health services. However, due to a lack of data, post-natal care was not included in this analysis. The analyses use data collected from NHFS 2015 and 2021. This report specifically focuses on changes in ANC and delivery services availability, readiness, infection prevention and control, process of care (only for ANC), and client satisfaction (only for ANC).

The objectives of this report are:

- Assess the changes in services available for ANC and delivery
- Assess the changes in readiness of services for ANC and delivery
- Assess the changes in infection prevention and control readiness for providing ANC and delivery services
- Assess the changes in adherence to the process of care during ANC service provision
- Assess the changes in client satisfaction for ANC services

2 METHODOLOGY

2.1 Data Collected in 2015 and 2021 NHFS

The data in this study were drawn from two consecutive, nationally representative NHFSs conducted in 2015 and 2021.^{1,2} The surveys provided information about the availability of basic health care services, the readiness of health facilities, the quality of the services provided by the health facility, and client satisfaction with the services. Both surveys collected data from hospitals, primary health care centers (PHCCs), health posts (HPs), community health units (CHUs), urban health centers (UHCs), and private hospitals across the seven provinces of Nepal. The standalone HIV testing and counseling centers (HTCs) were also included in the survey, although these facilities are not included in this analysis.

Both surveys included an inventory of the health facilities, an interview with service providers, and observation of client consultations for selected services that included antenatal care (ANC). In addition, an exit interview was also conducted with ANC clients, and the postpartum women who delivered at the health facilities and were ready for discharge. The 2021 NHFS also included observations of labor and delivery. However, we did not conduct an analysis for labor and delivery due to the absence of data in 2015. Detailed information about sample size and sampling procedures for both surveys is provided in the main report^{1,2} that included random samples of 1,000 health facilities in 2015 and 1,633 health facilities in 2021. The facilities were selected through equal probability systematic sampling with sample allocation.

Table 2 Sample size of health facilities, providers, and clients, by survey year

Sample size/Survey year	NHFS 2015	NHFS 2021
At facility level		
Total number of surveyed facilities	963	1,576
Number of facilities that offer ANC services	919	1,538
Number of facilities that offer delivery services	457	804
At provider level		
Total number of interviewed ANC service providers	2,480	3,849
Total number of interviewed providers of normal vaginal delivery services	1,757	2,742
At client level		
Number of observed ANC clients	1,502	1,966
Number of postpartum clients interviewed	309	546

The data for the analysis of ANC and delivery service provision were collected with the following methods:

- The inventory collected information on staffing, training, infrastructure and equipment, medicines, supplies, service components, work environment (such as staff meetings), quality assurance, management committee meetings, and external supervision in the 4 months before the interview, which was verified through observation.
- Interviews with a sample of service providers at the health facilities collected information on the providers' qualifications and professional experience with ANC and delivery services.
- Observation of services provided to pregnant women that assessed if the service providers adhered to service delivery guidelines and standards for ANC.

- Exit interviews with the clients who sought ANC and delivery services at the facility. These included the clients' experiences as service seekers at the facility, opinions on the instruction they received, the clients' perception of the quality of treatment received, and specific characteristics about the clients' background.

2.2 Description of Variables

There are a number of variables in this study, and detailed information about their construction is provided in Appendix 1.

Service availability

The service availability for ANC includes health facilities that provide ANC service for 5 days or more within a week. The service availability for delivery includes facilities that provide normal vaginal delivery services hereafter referred as "delivery service."

Service readiness

In this study we utilized items included in the WHO's Service Availability and Readiness Assessment (SARA) to measure readiness for ANC and delivery services.⁷ The ANC service readiness was measured as the availability of ANC guidelines and training, basic equipment, diagnostic tests, essential medicines, and commodities. An ANC service readiness index was created with the relevant variables in separate focus areas or domains, which included:

- **The availability of ANC guidelines and trained provider:** ANC guidelines and ANC training received by the health workers.
- **The availability of basic equipment:** A functional blood pressure apparatus, stethoscope, adult weighing machine, and fetoscope.
- **The availability of diagnostic tests:** A hemoglobin test, and urine protein and urine glucose tests.
- **The availability of essential medicines and commodities:** Folic acid tablets, iron and folic acid combined tablets, tetanus toxoid injections, and albendazole tablets.

For delivery, the domains were:

- **Delivery guidelines and training:** Guidelines and training received by the health workers who provide delivery services.
- **The availability of supplies and equipment:** Emergency transportation, a functional blood pressure apparatus, sterilization equipment, an examination light, a delivery pack, a suction apparatus, a manual vacuum extractor, a manual vacuum aspiration kit, a delivery bed, and a partograph in the facilities.
- **The availability of medicines:** Injectable uterotonic and magnesium sulphate.

Infection prevention and control

Infection prevention and control is important in routine health care service. Providing patients with high-quality health care and ensuring a safe workplace and effective infection prevention and control are essential. An infection prevention readiness score for both ANC and delivery was developed that included the availability of items such as soap and running water, alcohol-based hand disinfectant, latex gloves, needle destroyers or cutters, waste receptacles, and medical masks.

Adherence to the process of care

The adherence to the process of care indicator was analyzed only for ANC service. The 2015 NHFS report did not include the observation of delivery services, and could not be compared with NHFS 2021. Therefore, the analysis of the process of care for delivery services has not been analyzed in this study. The Quality Improvement Module for Health Services Strengthening, Management Division and the National Medical Standard for Maternal and Newborn Care, Volume III, MoHP, were referenced for the variables related to the process of care. The process of care variables were generated from the ANC client observation tool. The composite score for the process of care included the following domains:

- **Clinical history:** The client's history recorded by the providers and related to experience of danger signs of vaginal bleeding; swollen hands, face or extremities; headache or blurred vision; fetal movement; lower abdominal pain; vaginal discharge, and convulsions/unconsciousness.
- **Physical examination:** A physical examination with recording of the client's blood pressure, weighing the client, examining the client's conjunctive/palms for anemia, examining the client's legs/feet/hands for edema, palpating the client's abdomen for uterine height/fundal height with a tape measure, palpating the client's abdomen for fetal presentation during 8 months, and listening to the client's abdomen for a fetal heartbeat at 5 months.
- **Routine test:** Tests conducted in the health facility for hemoglobin, blood grouping, and urine (glucose/protein).
- **Counseling/prescription:** Providing referrals and/or counseling related to a human immunodeficiency virus (HIV) test; discussing nutrition; informing the client about progress of the pregnancy; discussing the importance of at least four ANC visits; prescribing or giving iron pills or folic acid or both; explaining the purpose, the method of taking, and the side effects of iron or folic acid; prescribing, giving or explaining the purpose of taking tetanus diphtheria toxoid injections; prescribing, giving or explaining the purpose of albendazole; counseling on birth preparedness; advising the client to use a skilled birth attendant and going to a health facility; and discussing early initiation or exclusively breastfeeding.

Client satisfaction

Client satisfaction of ANC services was captured with 11 questions in the exit interview about the services received. Clients could respond if they had a major, minor, or no problem in the care they received, or if they didn't know. For this analysis, binary variables were constructed from each question on if the client had no problem with the service. Therefore, having a major or minor problem or don't know were grouped together and given a value of zero to identify dissatisfied clients. Don't know cases were also given a value of zero.

Client satisfaction was not measured for delivery services due to lack of specific data. The question on satisfaction in the postpartum exit interview asks about all care received at the health facility, so satisfaction with delivery care specific could not be disaggregated.

Background characteristics

At the facility level, the background characteristics analyzed in the study included the facility type, the managing authority, location of the facility, ecological region, province, if regular quality assurance activities were performed (yes/no), if a staff management meeting was conducted at least once every 6 months (yes/no), if a meeting was conducted with management committee members at least once every

6 months (yes/no), if there had been external supervision in the facility in the last 4 months (occurred/not occurred), and if a system existed to determine client opinions (yes/no). At the provider level, the background characteristics were the provider type, sex, and if they were supervised in the last 4 months. At the client level, the background characteristics were age (in years), education, caste/ethnicity, pregnancy, and number visit (that is, first ANC visit or follow-up visit). The detailed list of background characteristics with their operational definitions are provided in Appendix 2 and the descriptive tables for the variables in Appendices 3–5.

2.3 Data Analysis

We present descriptive analyses of ANC and delivery service readiness, the process of care for ANC services, and client satisfaction for ANC. The service readiness score, the infection prevention and control readiness score, the process of care score, and the client satisfaction score of ANC services were calculated with different indicators. The indicators that were used to create the scores were binary and given a value of 1 if the item was present (readiness/infection prevention), occurred (the process of care), or no issues/problems (client satisfaction). If the item was not present, had not occurred, or indicated problems or “don’t know,” we assigned a value of 0. To facilitate comparison, we developed scores with a simple additive index. The simple additive index was used to produce scores by adding a number of binary variables. This procedure involved adding all binary indicators, dividing the total number of indicators, and then multiplying by 100 to obtain a score (%).

Descriptive analysis of ANC and delivery services, along with the background characteristics, availability of different items, and scores of the service readiness, infection prevention and control, adherence to the process of care (only for ANC), and clients’ satisfaction (only for ANC) are presented. In addition, we compared all aspects of quality of care and background characteristics in the NHFS 2015 and NHFS 2021 to determine significant differences. We used a *t* test to assess the statistical significance between two years. The *p* value < .05 and 95% confidence interval (CI) were considered for statistical significance. Since the health facilities sample was a stratified sample, sampling weights were calculated based on sampling probabilities separately for each sampling stratum. To ensure the actual representation of the survey results, sampling weights were applied, and a complex sample design was considered during analysis. STATA 17.0 was used for the analysis.

2.4 Ethical Considerations

Both NHFS protocols were reviewed and approved by the Nepal Health Research Council (NHRC) and the institutional review board of ICF. We used a de-identified publicly available dataset from the DHS website for this analysis.* In both surveys, the interviewers obtained informed consent from the health facility in charge, service providers, and the clients who were observed or participated in exit interviews.

*www.dhsprogram.com

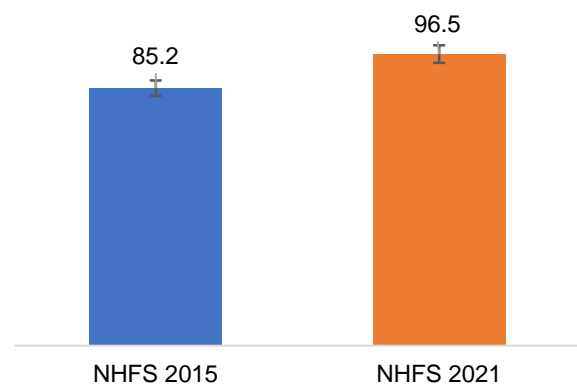
3 RESULTS

3.1 Availability of ANC Services

Figure 2 presents the change in antenatal care (ANC) service availability for 5 days or more in a week. The percentage of facilities that offered ANC service increased significantly from 85% in 2015 to 97% in 2021.

The change in the availability of ANC services for 5 days or more in a week by facility background characteristics is shown in Table 3. For health facility type, except for private hospitals, there was a significant increase in the availability of ANC services with the largest increase among public hospitals by 19 percentage points between 2015 and 2021. For ecoregion, the availability of ANC services showed significant increase in the Hill and Terai regions in 2021. Madhesh and Lumbini provinces have shown significant increase in the availability of ANC services in 2021 compared to 2015 with increase of 23 and 25 percentage points, respectively. The availability of ANC service has increased significantly from 2015 to 2021 in the facilities that conducted regular quality assurance activities, conducted a staff management meeting at least once every 6 months, conducted a meeting with management committee members at least once every 6 months, had a system to determine the clients' opinions, and facilities that had external supervision in the previous 4 months.

Figure 2 Change in ANC service availability 5 days or more in a week (%)



ANC = antenatal care
The *p* value of the difference between the surveys is *p* < .001.

Table 3 Change in the availability of ANC services for 5 days or more in a week in 2015 and 2021, by facility background characteristics

Variable	2015 NHFS		2021 NHFS		Difference	p value
	%	95% CI	%	95% CI		
Overall score	85.2	[81.7, 88.2]	96.5	[94.9, 97.6]	11.3	***
Facility type						
Public hospitals	62.5	[53.6, 70.6]	81.4	[73.7, 87.2]	18.9	**
PHCCs	78.2	[71.7, 83.5]	94.0	[89.4, 96.7]	15.8	***
Basic health care centers (HP/UHC/CHU)	85.4	[81.3, 88.7]	97.0	[95.1, 98.2]	11.6	***
Private hospitals	96.1	[88.7, 98.7]	97.9	[95.2, 99.1]	1.8	NS
Managing authority						
Public	84.5	[80.7, 87.6]	96.4	[94.7, 97.6]	11.9	***
Private	96.1	[88.7, 98.7]	97.9	[95.2, 99.1]	1.8	NS
Ecoregion						
Mountain	91.7	[84.3, 95.8]	97.3	[92.7, 99.0]	5.6	NS
Hill	89.5	[84.7, 92.9]	97.3	[95.2, 98.4]	7.8	***
Terai	76.6	[69.3, 82.6]	95.0	[91.3, 97.2]	18.4	***
Province						
Koshi	93.1	[85.7, 96.8]	95.7	[90.1, 98.2]	2.6	NS
Madhesh	73.1	[60.7, 82.7]	96.3	[88.4, 98.9]	23.2	***
Bagmati	92.2	[85.7, 95.9]	97.3	[93.8, 98.9]	5.1	NS
Gandaki	90.0	[78.8, 95.6]	97.7	[96.0, 98.7]	7.7	NS
Lumbini	69.7	[57.8, 79.5]	94.6	[88.4, 97.6]	24.9	***
Karnali	91.3	[78.1, 96.9]	98.3	[91.7, 99.7]	7.0	NS
Sudurpaschim	90.9	[81.3, 95.9]	96.3	[91.0, 98.6]	5.4	NS
Performed regular quality assurance activities						
Yes	85.7	[80.9, 89.5]	96.7	[94.7, 97.9]	11.0	***
Conducted staff management meeting at least once every 6 months						
Yes	84.8	[80.8, 88.2]	96.4	[94.6, 97.6]	8.2	***
Conducted meeting with management committee members at least once every 6 months						
Yes	87.9	[81.4, 92.4]	96.1	[91.4, 98.3]	11.6	***
System to determine client opinions						
Yes	85.4	[79.9, 89.5]	96.4	[94.4, 97.6]	11.0	***
External supervision in the last 4 months						
Occurred	84.6	[80.9, 87.8]	96.4	[94.7, 97.5]	11.8	***

ANC = antenatal care, PHCCs = primary health care centers, HP = health post, UHC = urban health center, CHU = community health unit

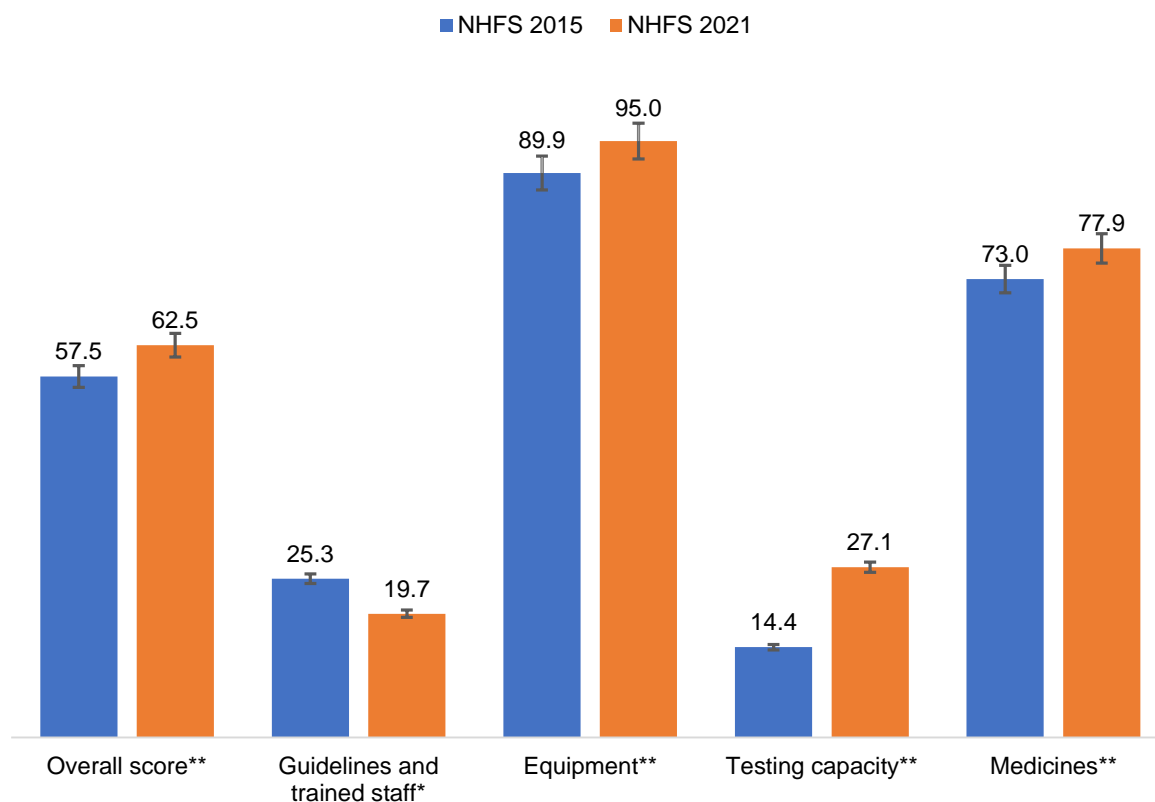
* $p < .05$, ** $p < .01$, *** $p < .001$; NS = not significant

3.2 Service Readiness for ANC

Figure 3 shows the change in the availability of four service indicators or domains among facilities that offer ANC services and the overall readiness score on the day of the survey in 2015 and 2021. The overall readiness score for facilities that provide ANC services has increased significantly from 58% in 2015 to 63% in 2021.

The mean score for guidelines and staff training decreased significantly by 5 percentage points. The overall mean score for the equipment increased significantly by 5 percentage points. There was good improvement in the availability of basic tests in the facilities in 2021 compared to 2015. The mean testing capacity of the facilities increased significantly by 13 percentage points from 14% in 2015 to 27% in 2021. The mean score of overall medicines also increased significantly in 2021 compared to 2015 by 5 percentage points. (For details, see Appendix 6).

Figure 3 Change in service readiness: Percentage of facilities that provide ANC service indicators on the day of the survey (%)



ANC = antenatal care

Asterisks indicate the *p* value of the difference between the surveys with * *p* < .05 and ** *p* < .01.

Change in the overall service readiness score for ANC services in the facilities by facility background characteristics is shown in Table 4. Among the various health facility types, the readiness has increased in PHCCs by 9 percentage points and in BHCCs by 6 percentage points in 2021 as compared to 2015. The increase was statistically significant. For management authority, there was a statistically significant increase in the service readiness in public health facilities by 6 percentage points in 2021 compared to 2015, and no significant change among private hospitals. The service readiness score of facilities across the Mountain, Hill, and Terai regions increased significantly in 2021 compared to 2015.

By province, the increase in the service readiness score was the highest in Koshi with a 10 percentage point increase between the surveys. Significant increases in the service readiness scores were also found in Koshi, Madhesh, Bagmati, Gandaki, and Sudurpaschim provinces, although there was no significant change in the Lumbini and Karnali provinces. There were also significant increases in service readiness score between the surveys for facilities that performed regular quality assurance activities, conducted a staff management meeting at least once every 6 months, conducted a meeting with management committee members at least once every 6 months, had a system to determine clients' opinions, and had external supervision in the past 4 months.

Table 4 Change in overall readiness of ANC service, by facility characteristics

Variable	2015 NHFS		2021 NHFS		Difference	p value
	%	95% CI	%	95% CI		
Overall score	57.5	[56.5, 58.2]	62.5	[61.8, 63.2]	5.0	***
Facility types						
Public hospitals	83.3	[79.6, 87.1]	84.2	[80.7, 87.6]	0.9	NS
PHCCs	73.6	[69.4, 77.8]	82.3	[79.6, 85.0]	8.7	***
Basic health care centers (HP/UHC/CHU)	54.5	[53.8, 55.3]	60.3	[59.7, 61.0]	5.8	***
Private hospitals	74.4	[70.3, 78.6]	71.7	[68.9, 74.5]	-2.7	NS
Managing authority						
Public	56.2	[55.4, 57.0]	61.8	[61.1, 62.5]	5.6	***
Private	74.4	[70.3, 78.6]	71.7	[68.9, 74.5]	-2.7	NS
Ecoregion						
Mountain	56.8	[54.5, 58.9]	61.8	[59.9, 63.8]	5.0	**
Hill	57.5	[56.1, 58.5]	62.9	[62.0, 63.8]	5.4	***
Terai	57.8	[56.3, 59.3]	62.1	[60.8, 63.4]	4.3	**
Province						
Koshi	55.4	[53.5, 57.3]	65.7	[63.9, 67.4]	10.3	***
Madhesh	53.3	[51.4, 55.3]	58.0	[56.3, 59.8]	4.7	**
Bagmati	58.8	[56.7, 60.8]	63.9	[62.4, 65.5]	5.1	**
Gandaki	59.2	[57.0, 61.3]	62.6	[60.8, 64.3]	3.4	*
Lumbini	60.8	[58.6, 62.9]	63.7	[61.9, 65.5]	2.7	NS
Karnali	58.1	[55.0, 61.2]	57.3	[55.3, 59.4]	-0.8	NS
Sudurpaschim	57.5	[54.5, 60.6]	63.5	[61.6, 65.6]	6.0	**
Performed regular quality assurance activities						
Yes	58.6	[57.5, 58.9]	63.8	[62.9, 64.7]	5.2	***
Conducted staff management meeting at least once every 6 months						
Yes	58.1	[57.2, 59.0]	63.6	[62.9, 64.4]	5.5	***
Conducted meeting with management committee members at least once every 6 months						
Yes	57.4	[56.5, 58.5]	63.4	[62.6, 64.2]	6.0	***
System to determine client opinions						
Yes	59.9	[58.5, 61.3]	64.8	[63.9, 65.8]	4.9	***
External supervision in the last 4 months						
Occurred	57.7	[56.9, 58.6]	62.6	[61.9, 63.3]	4.9	***

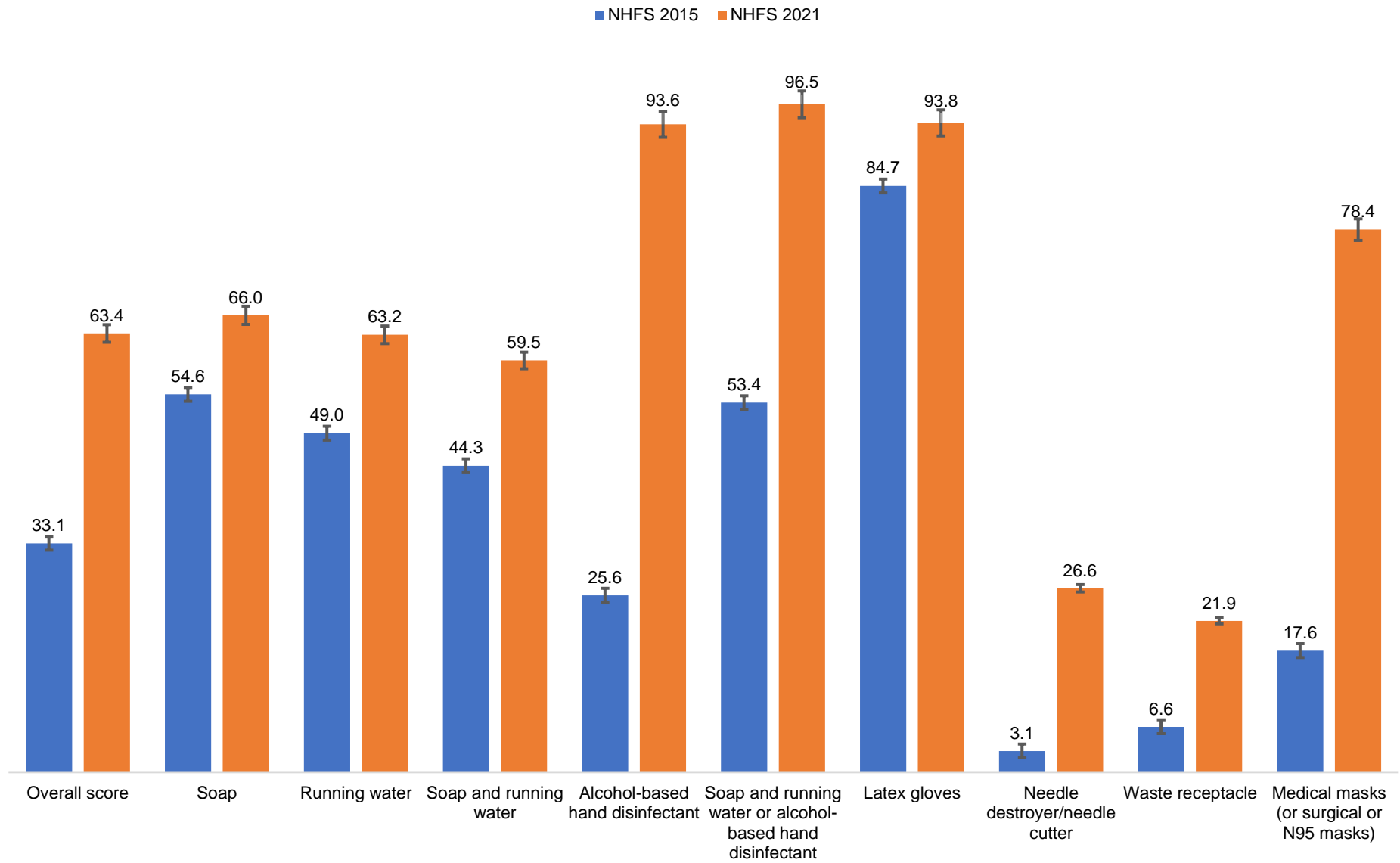
ANC = antenatal care, PHCCs = primary health care centers, HP = health post, UHC = urban health center, CHU = community health unit

* $p < .05$, ** $p < .01$, *** $p < .001$, NS = not significant

3.3 Infection Prevention and Control Readiness in the Health Facilities that Provide ANC Services

Figure 4 presents the change in the availability of items for infection prevention and control at the facilities that provide ANC services. There was a significant increase in the availability of items for infection prevention and control in 2021 as compared to 2015. The proportion of facilities with all nine items has increased from 33% in 2015 to 63% in 2021. The most remarkable improvements were seen in the availability of alcohol-based hand disinfectant (68 percentage point increase) followed by the availability of medical masks (61 percentage point increase).

Figure 4 Change in infection prevention and control readiness in the health facilities that provide ANC services (%)



ANC = antenatal care
 All changes in the figure were statistically significant at $p < .001$.

Table 5 presents the distribution of change in infection prevention and control readiness score by facility background characteristics for 2015 and 2021. Significant changes were seen in infection prevention and control readiness score by all characteristics of health facilities as shown. Public facilities showed a larger increase in infection prevention and control readiness (31 percentage points increase) between the surveys compared to the private facilities (17 percentage points).

Table 5 Change in infection prevention and control readiness for ANC services, by facility background characteristics

Variable	2015 NHFS		2021 NHFS		Difference	p value
	%	95% CI	%	95% CI		
Overall score	33.1	[31.8, 34.4]	63.4	[62.5, 64.4]	30.3	***
Facility types						
Public hospitals	48.0	[37.8, 58.1]	71.9	[66.1, 77.7]	23.9	***
Public PHCCs	38.4	[32.2, 44.5]	62.8	[58.1, 67.6]	24.4	***
Public basic health care centers (HP/UHC/CHU)	31.1	[29.7, 32.3]	62.8	[61.8, 63.9]	31.7	***
Private hospitals	51.4	[45.2, 57.7]	68.1	[64.5, 71.7]	16.7	***
Managing authority						
Public	51.4	[45.2, 57.7]	68.1	[64.5, 71.7]	31.3	***
Private	31.8	[30.5, 33.0]	63.1	[62.1, 64.1]	16.7	***
Ecoregion						
Mountain	32.7	[29.3, 36.2]	61.6	[58.9, 64.3]	28.9	***
Hill	34.3	[32.4, 36.1]	64.6	[63.4, 65.9]	30.3	***
Terai	31.4	[29.4, 33.5]	62.3	[60.6, 64.1]	30.9	***
Province						
Koshi	30.7	[27.9, 33.6]	56.6	[54.1, 59.1]	25.9	***
Madhesh	26.4	[23.8, 29.1]	60.0	[57.7, 62.4]	33.6	***
Bagmati	37.0	[33.9, 40.1]	70.4	[68.2, 72.5]	33.4	***
Gandaki	39.9	[36.3, 43.4]	66.6	[63.9, 69.3]	26.7	***
Lumbini	34.8	[31.5, 38.2]	64.1	[61.8, 66.4]	29.3	***
Karnali	33.5	[29.3, 37.7]	64.8	[61.6, 68.1]	31.3	***
Sudurpaschim	29.3	[25.1, 33.5]	60.4	[57.9, 62.8]	31.1	***
Performed regular quality assurance activities						
Yes	34.8	[33.1, 36.6]	64.5	[63.2, 65.8]	29.7	***
Conducted staff management meeting at least once every 6 months						
Yes	33.2	[31.8, 34.6]	63.7	[62.7, 64.8]	30.5	***
Conducted meeting with management committee members at least once every 6 months						
Yes	32.8	[31.3, 34.4]	64.8	[63.7, 65.9]	32.0	***
System to determine client opinions						
Yes	35.9	[33.9, 37.9]	64.5	[63.2, 65.8]	28.6	***
External supervision in the last 4 months						
Occurred	33.3	[32.0, 34.6]	63.5	[62.5, 64.5]	30.2	***

ANC = antenatal care, PHCCs = primary health care centers, HP = health post, UHC = urban health center, CHU = community health unit

*** $p < .001$

3.4 Availability of Delivery Service

Figure 5 shows the change in the availability of delivery services in 2015 and 2021. Of the total surveyed health facilities, delivery services were available in approximately only half of the facilities in both surveys with no significant change.

Table 6 shows the change in delivery service availability in 2015 and 2021 by facility background characteristics. The results show that private facilities, specifically private hospitals, had a significant decrease from 64% to 53% in delivery service availability from 2015 to 2021. In addition, facilities that had meetings with management committee members conducted at least once every 6 months significantly decreased their delivery service availability by 5 percentage points. No other variables showed significant change in the delivery service availability in 2021 as compared to 2015.

Figure 5 Change in delivery service availability (%)

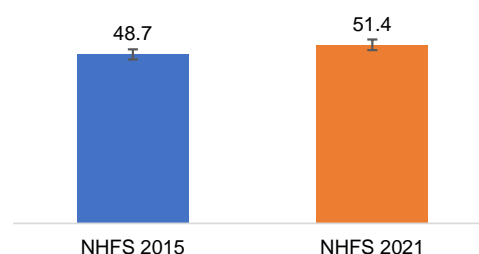


Table 6 Change in delivery service availability, by facility background characteristics

Variable	2015 NHFS		2021 NHFS		Difference	p value
	%	95% CI	%	95% CI		
Facility types						
Public hospitals	95.0	[83.1, 98.6]	93.7	[88.0, 96.8]	-1.3	NS
PHCCs	96.1	[92.5, 98.0]	97.3	[93.6, 98.9]	1.2	NS
Basic health care centers (HP/UHC/CHU)	43.6	[39.0, 48.3]	48.2	[44.2, 52.2]	4.6	NS
Private hospitals	64.2	[53.5, 73.7]	52.8	[44.2, 61.4]	-11.4	*
Managing authority						
Public	47.4	[43.1, 51.8]	51.3	[47.6, 55.0]	3.9	NS
Private	64.2	[53.5, 73.7]	52.8	[44.2, 61.4]	-11.4	*
Ecoregion						
Mountain	57.2	[47.1, 66.7]	64.9	[55.5, 73.2]	7.7	NS
Hill	57.4	[50.8, 63.7]	60.3	[55.5, 64.9]	2.9	NS
Terai	33.4	[27.8, 39.4]	32.6	[27.0, 38.7]	-0.8	NS
Province						
Koshi	47.4	[37.3, 57.6]	51.2	[41.8, 60.4]	3.8	NS
Madhesh	23.1	[16.2, 31.8]	24.9	[17.1, 34.8]	1.8	NS
Bagmati	44.5	[35.3, 54.1]	47.2	[39.0, 55.5]	2.7	NS
Gandaki	55.3	[40.2, 69.4]	46.3	[37.0, 55.9]	-9.0	NS
Lumbini	45.7	[35.7, 56.2]	56.8	[47.7, 65.5]	11.1	NS
Karnali	83.3	[69.7, 91.6]	77.8	[70.4, 83.9]	-5.5	NS
Sudurpaschim	75.4	[62.8, 84.8]	76.8	[70.1, 82.4]	1.4	NS
Performed regular quality assurance activities						
Yes	51.3	[45.8, 56.7]	56.6	[51.7, 61.4]	5.3	NS
Conducted staff management meeting at least once every 6 months						
Yes	51.1	[46.3, 55.9]	53.7	[49.7, 57.5]	2.6	NS
Conducted meeting with management committee members at least once every 6 months						
Yes	49.3	[41.9, 56.7]	44.0	[36.9, 51.3]	-5.3	*
System to determine client opinions						
Yes	55.1	[48.6, 61.4]	61.8	[56.9, 66.4]	6.7	NS
External supervision in the last 4 months						
Occurred	49.9	[45.6, 54.1]	51.6	[48.0, 55.3]	1.7	NS

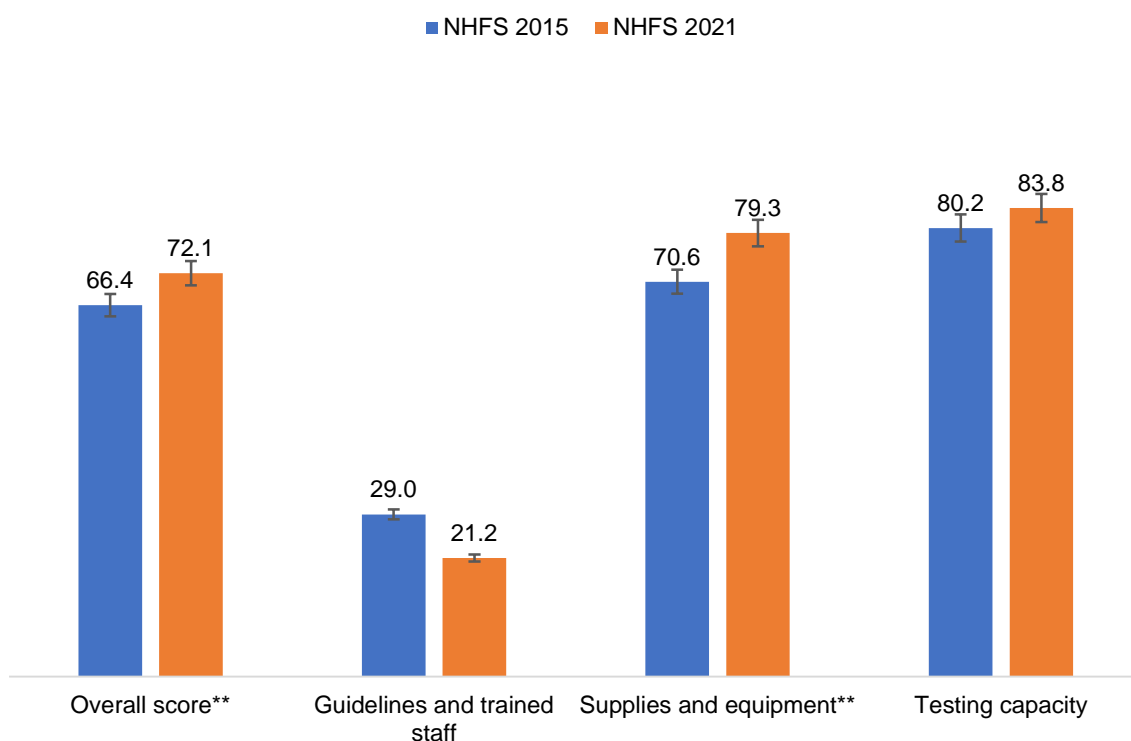
ANC = antenatal care, PHCCs = primary health care centers, HP = health post, UHC = urban health center, CHU = community health unit

* $p < .05$, NS = not significant

3.5 Service Readiness for Delivery Services

Figure 6 shows the change in delivery readiness indicators on the days of the surveys in 2015 and 2021. The overall delivery service readiness score increased significantly from 66% in 2015 to 72% in 2021. The overall mean score for the availability of supplies and equipment also increased by 9% between the two surveys. On the other hand, the mean score for staff training and guidelines decreased significantly in 2021 by 8%. The difference in mean score for the availability of medicines between 2015 and 2021 was not statistically significant. (For details, see Appendix 8.)

Figure 6 Change in delivery service readiness: Percentage of facilities that provide delivery services on the day of the survey (%)



Asterisks in figure indicates the *p* value of the difference between the surveys with * $p < .05$, ** $p < .01$.

Table 7 shows the change in the overall readiness score for delivery services by facility background characteristics in NHFS 2015 and NHFS 2021. Within the types of health facilities, the overall readiness score significantly increased in PHCCs and BHCCs by 4% and 7%, respectively. Within the managing authority, there was a significant increase in readiness of 6 percentage points for public facilities. The service readiness score significantly increased by approximately 7 percentage points in both the Mountain and Hill regions, although there was no significant change in the Terai region between the two surveys. Across the provinces, a higher increase in the service readiness score was seen in the health facilities of Karnali Province (10 percentage points), followed by Koshi (8 percentage points), Bagmati (6 percentage points), and Gandaki (6 percentage points). The increases were statistically significant.

The delivery readiness score increased significantly between 2015 and 2021 for all other health facility variables in Table 7 that included performing regular quality assurance activities, conducting a staff management meeting at least once every 6 months, conducting a meeting with management committee members at least once every 6 months, possessing a system to determine clients' opinions, and having external supervision in the previous 4 months.

Table 7 Change in overall readiness of delivery service, by facility background characteristics

Variable	2015 NHFS		2021 NHFS		Difference	p value
	%	95% CI	%	95% CI		
Overall score	66.4	[65.1, 67.7]	72.1	[71.3, 72.9]	5.7	***
Facility types						
Public hospitals	88.8	[85.6, 91.9]	86.4	[83.3, 89.5]	-2.4	NS
PHCCs	75.0	[70.9, 79.1]	78.6	[75.6, 81.6]	3.6	**
Basic health care centers (HP/UHC/CHU)	63.5	[62.1, 64.9]	70.4	[69.6, 71.2]	6.9	***
Private hospitals	71.7	[67.0, 76.3]	75.7	[71.8, 79.7]	4.0	NS
Managing authority						
Public	65.9	[64.5, 67.2]	71.8	[71.0, 72.6]	5.9	***
Private	71.7	[67.0, 76.3]	75.7	[71.8, 79.7]	4.0	NS
Ecoregion						
Mountain	64.9	[61.1, 68.8]	72.2	[70.0, 74.3]	7.3	**
Hill	64.6	[62.9, 66.3]	71.4	[70.4, 72.4]	6.8	***
Terai	71.7	[69.3, 74.1]	74.1	[72.5, 75.7]	2.4	NS
Province						
Koshi	64.5	[60.5, 68.4]	72.1	[70.1, 74.0]	7.6	**
Madhesh	71.2	[67.8, 74.6]	72.9	[70.3, 75.6]	1.7	NS
Bagmati	68.1	[64.7, 71.4]	74.1	[71.9, 76.2]	6.0	*
Gandaki	67.8	[64.9, 70.6]	73.4	[71.6, 75.1]	5.6	**
Lumbini	69.9	[66.7, 73.1]	73.4	[71.6, 75.3]	3.5	NS
Karnali	58.9	[55.6, 62.3]	68.8	[66.7, 70.9]	9.9	***
Sudurpaschim	66.1	[62.6, 69.5]	70.0	[67.9, 72.0]	3.9	NS
Performed regular quality assurance activities						
Yes	67.3	[65.5, 69.2]	73.8	[72.8, 74.8]	6.5	***
Conducted staff management meeting at least once every 6 months						
Yes	67.3	[65.9, 68.7]	72.2	[71.3, 73.1]	4.9	***
Conducted meeting with management committee members at least once every 6 months						
Yes	67.1	[65.4, 68.8]	72.4	[71.4, 73.3]	5.3	***
System to determine client opinions						
Yes	70.1	[68.4, 71.9]	72.7	[71.7, 73.7]	2.6	**
External supervision in the last 4 months						
Occurred	66.6	[65.2, 68.0]	72.1	[71.3, 72.9]	5.5	***

ANC = antenatal care, PHCCs = primary health care centers, HP = health post, UHC = urban health center, CHU = community health unit

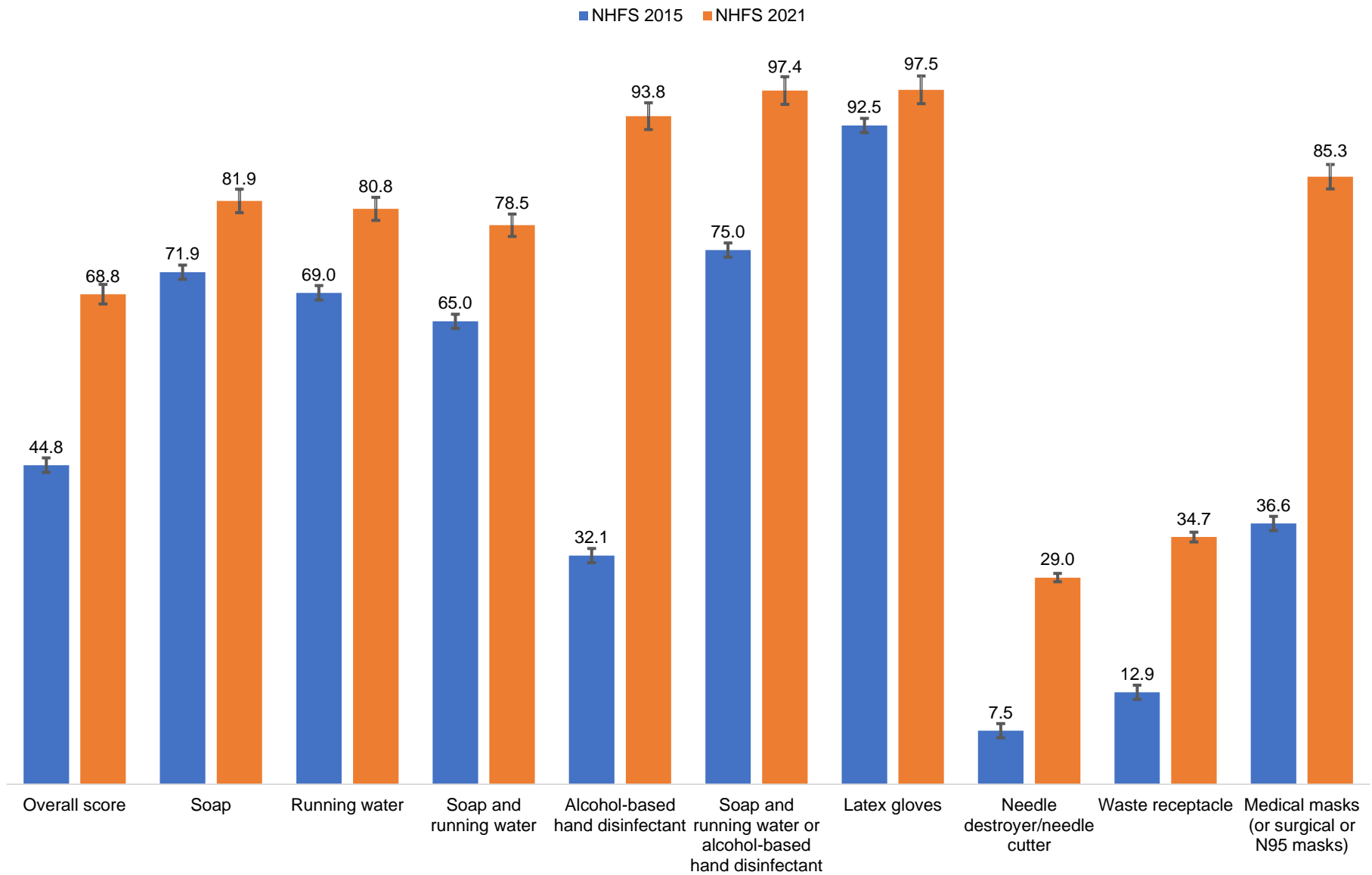
* $p < .05$, ** $p < .01$, *** $p < .001$, NS = not significant

Appendix 7 shows changes in the service readiness domains by province. While the staff and guidelines domain showed some decreases, specifically in Lumbini (18 percentage points) and Karnali (15 percentage points) Province, the other three domains had increases where significant changes were seen. Bagmati and Sudurpaschim Province had significant increases of 6 and 10 percentage points, respectively, in the equipment domain. All provinces except Madhesh and Karnali showed significant increases in the testing capacity domain. Availability of medicines improved in three provinces—Madhesh (12 percentage points), Koshi (9 percentage points), and Bagmati (4 percentage points).

3.6 Infection Prevention and Control Readiness in the Health Facilities that Provide Delivery Services

Figure 7 presents the change in the readiness for infection prevention and control for delivery services measured as the availability of basic items for infection prevention and control at the health facilities that provide delivery services. There was a marked increase in the availability of items for infection prevention and control in 2021 as compared to 2015. The proportion of facilities with all nine items, or the overall score, significantly increased from 45% in 2015 to 69% in 2021. The largest improvements were found for alcohol-based hand disinfectant followed by medical masks with a 62 and 49 percentage point increase respectively between the surveys. The increase for the availability of all the items from 2015 to 2021 shown in Figure 7 was statistically significant.

Figure 7 Change in infection prevention and control readiness in the health facilities that provide delivery services (%)



All changes in the figure were statistically significant at $p < .001$.

Table 8 presents the change in infection prevention and the control readiness score by facility background characteristics for 2015 and 2021. Significant increases were seen in the infection prevention and control score across all characteristics of health facilities shown in Table 8. Public facilities showed a larger increase in infection prevention and control readiness between the surveys compared to private facilities (25 percentage point increase versus 13 percentage points, respectively).

Table 8 Change in infection prevention and control readiness in health facilities that provide delivery services, by facility characteristics

Variable	2015 NHFS		2021 NHFS		Difference	p value
	%	95% CI	%	95% CI		
Overall score	44.8	[42.9, 46.8]	68.8	[67.5, 70.1]	20.0	***
Facility types						
PHCCs	47.7	[41.9, 53.4]	66.7	[61.9, 71.5]	19.0	***
Basic health care centers (HP/UHC/CHU)	41.3	[39.5, 43.3]	67.6	[66.3, 68.9]	26.3	***
Private hospitals	61.2	[53.2, 69.3]	75.1	[69.0, 81.3]	13.9	**
Managing authority						
Public	43.1	[41.2, 44.9]	68.3	[67.0, 69.5]	25.2	***
Private	61.2	[53.2, 69.3]	75.1	[69.0, 81.3]	13.9	**
Ecoregion						
Mountain	42.0	[36.7, 47.3]	67.6	[64.8, 70.4]	25.6	***
Hill	44.4	[41.9, 46.9]	68.9	[67.3, 70.5]	24.5	***
Terai	47.6	[44.0, 51.2]	69.4	[66.5, 72.3]	21.8	***
Province						
Koshi	42.0	[37.7, 46.3]	67.2	[64.2, 70.1]	25.2	***
Madhesh	42.2	[36.8, 47.5]	68.2	[63.3, 73.1]	26.0	***
Bagmati	51.8	[46.6, 57.0]	76.9	[73.7, 80.2]	25.1	***
Gandaki	46.9	[42.1, 51.7]	67.7	[63.9, 71.5]	20.8	***
Lumbini	48.8	[44.1, 53.4]	67.0	[64.4, 69.6]	18.2	***
Karnali	38.8	[34.2, 43.4]	68.5	[65.0, 72.1]	29.7	***
Sudurpaschim	41.1	[35.6, 46.6]	64.0	[61.3, 66.7]	22.9	***
Performed regular quality assurance activities						
Yes	45.7	[43.2, 48.3]	69.6	[68.0, 71.2]	23.9	***
Conducted staff management meeting at least once every 6 months						
Yes	45.2	[43.1, 47.3]	68.9	[67.5, 70.2]	23.7	***
Conducted meeting with management committee members at least once every 6 months						
Yes	44.9	[41.4, 47.3]	69.6	[68.0, 71.2]	24.7	***
System to determine client opinions						
Yes	49.3	[46.6, 52.1]	69.2	[67.6, 70.8]	19.9	***
External supervision in the last 4 months						
Occurred	44.9	[42.9, 46.9]	68.9	[67.6, 70.2]	24.0	***

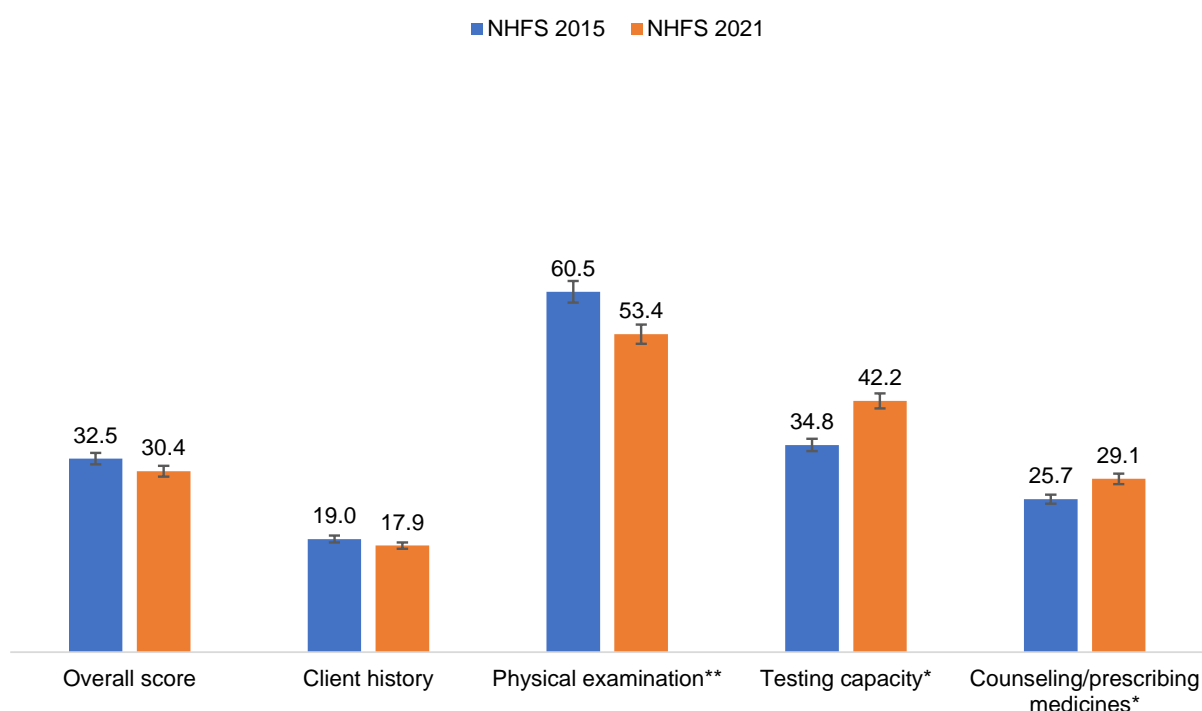
ANC = antenatal care, PHCCs = primary health care centers, HP = health post, UHC = urban health center, CHU = community health unit
 ** $p < .01$, *** $p < .001$

3.7 Adherence to the Process of Care for ANC Services

Figure 8 presents the change in the adherence to the process of care indicators related to ANC services across 2015 and 2021. There was no significant change in the overall process of care score between 2015 and 2021.

The overall score for client history, which is composed of seven items (see Appendix 9), remained unchanged between the two surveys and was relatively low overall. The overall score for physical examinations, which is also composed of seven items (as shown in Appendix 8), decreased significantly between 2015 and 2021 by 7 percentage points. The overall score for testing capacity, which combines three separate diagnostic tests increased significantly from 35% in 2015 to 42% in 2021. The overall score for counseling/medicine prescription, with 11 items, exhibited a modest but significant increase of 3 percentage points. (For details, refer to Appendix 9.)

Figure 8 Change in the adherence to the process of care for ANC services (%)



ANC = antenatal care

Asterisks in figure indicate the *p* value of the difference between the surveys with * *p* < .05, ** *p* < .01.

Table 9 presents the change in the process of care score by facility and provider background characteristics in 2015 and 2021. There was no significant change found in the overall adherence to the process of care score between the two surveys. In addition, there was no significant change in the overall process of care by all background variables except for two. Facilities that performed regular quality assurance activities and had male providers showed a significant decrease in the process of care with a decrease of 3 and 8 percentage points respectively.

Table 9 Change in the overall process of care for ANC services, by facility and provider background characteristics

Variable	2015 NHFS	2021 NHFS	Difference	<i>p</i> value
	% 95% CI	% 95% CI		
Overall score	32.5 [31.5–33.6]	30.4 [29.4–31.4]	-2.1	NS
Facility types				
Public hospitals	32.9 [30.7–35.0]	29.9 [27.4–32.3]	-3.0	NS
PHCCs	33.5 [30.4–36.6]	32.9 [28.6–37.1]	-0.6	NS
Basic health care centers (HP/UHC/CHU)	30.3 [28.8–31.8]	29.6 [28.2–30.9]	-0.7	NS
Private hospitals	35.6 [33.1–38.2]	31.3 [29.7–33.0]	-4.3	NS
Managing authority				
Public	31.7 [30.6–32.9]	30.0 [28.8–31.2]	-1.7	NS
Private	35.6 [33.1–38.2]	31.3 [29.7–33.0]	-4.3	NS
Ecoregion				
Mountain	32.6 [27.9–37.3]	30.0 [24.6–35.3]	-2.6	NS
Hill	33.6 [32.1–35.1]	31.2 [29.9–32.6]	-2.4	NS
Terai	31.1 [29.5–32.7]	29.7 [28.3–31.1]	-1.4	NS
Province				
Koshi	33.7 [31.1–36.4]	28.7 [26.3–31.2]	-5.0	NS
Madhesh	30.4 [27.9–32.8]	28.0 [25.7–30.4]	-2.4	NS
Bagmati	32.2 [30.4–34.1]	32.4 [30.7–34.0]	0.2	NS
Gandaki	31.3 [27.0–35.7]	32.3 [27.2–37.3]	1.0	NS
Lumbini	33.4 [30.3–36.4]	30.2 [27.6–32.8]	-3.2	NS
Karnali	34.8 [30.4–39.2]	31.4 [28.3–34.6]	-3.4	NS
Sudurpaschim	34.9 [30.9–38.9]	32.5 [29.8–35.3]	-2.4	NS

Continued...

Table 9—Continued

Variable	2015 NHFS	2021 NHFS	Difference	p value
	% 95% CI	% 95% CI		
Performed regular quality assurance activities				
Yes	34.0 [32.6–35.3]	30.9 [29.8–32.0]	-3.1	*
Conducted staff management meeting at least once every 6 months				
Yes	32.3 [31.1–33.4]	30.4 [29.4–31.4]	-1.9	NS
Conducted meeting with management committee members at least once every 6 months				
Yes	31.4 [30.0–32.9]	30.4 [29.4–31.5]	-1.0	NS
System to determine client opinions				
Yes	33.0 [31.6–34.3]	30.8 [29.7–31.9]	-2.2	NS
External supervision in the last 4 months				
Occurred	32.5 [31.3–33.6]	30.4 [29.4–31.4]	-2.1	NS
Providers' sex				
Male	32.5 [29.2–35.9]	24.5 [21.8–27.1]	-8.0	*
Female	32.5 [31.4–33.7]	31.3 [30.3–32.3]	-1.2	NS
Provider type				
Nurse	33.4 [32.1–34.7]	31.3 [30.1–32.5]	-2.1	NS
Paramedics	27.3 [22.6–32.0]	14.7 [7.2–22.3]	-12.6	NS
Medical officers	30.5 [26.5–34.5]	25.0 [21.5–28.5]	-5.5	NS
Specialist	32.0 [29.7–34.3]	30.0 [28.2–31.7]	-2.0	NS
Received training in ANC in the last 24 months				
Yes	34.3 [32.1–36.5]	30.5 [27.1–33.8]	-3.8	NS
Supervision within 3 months				
Yes	32.7 [31.2–34.2]	29.6 [28.1–31.1]	-3.1	NS

ANC = antenatal care, PHCCs = primary health care centers, HP = health post, UHC = urban health center, CHU = community health unit

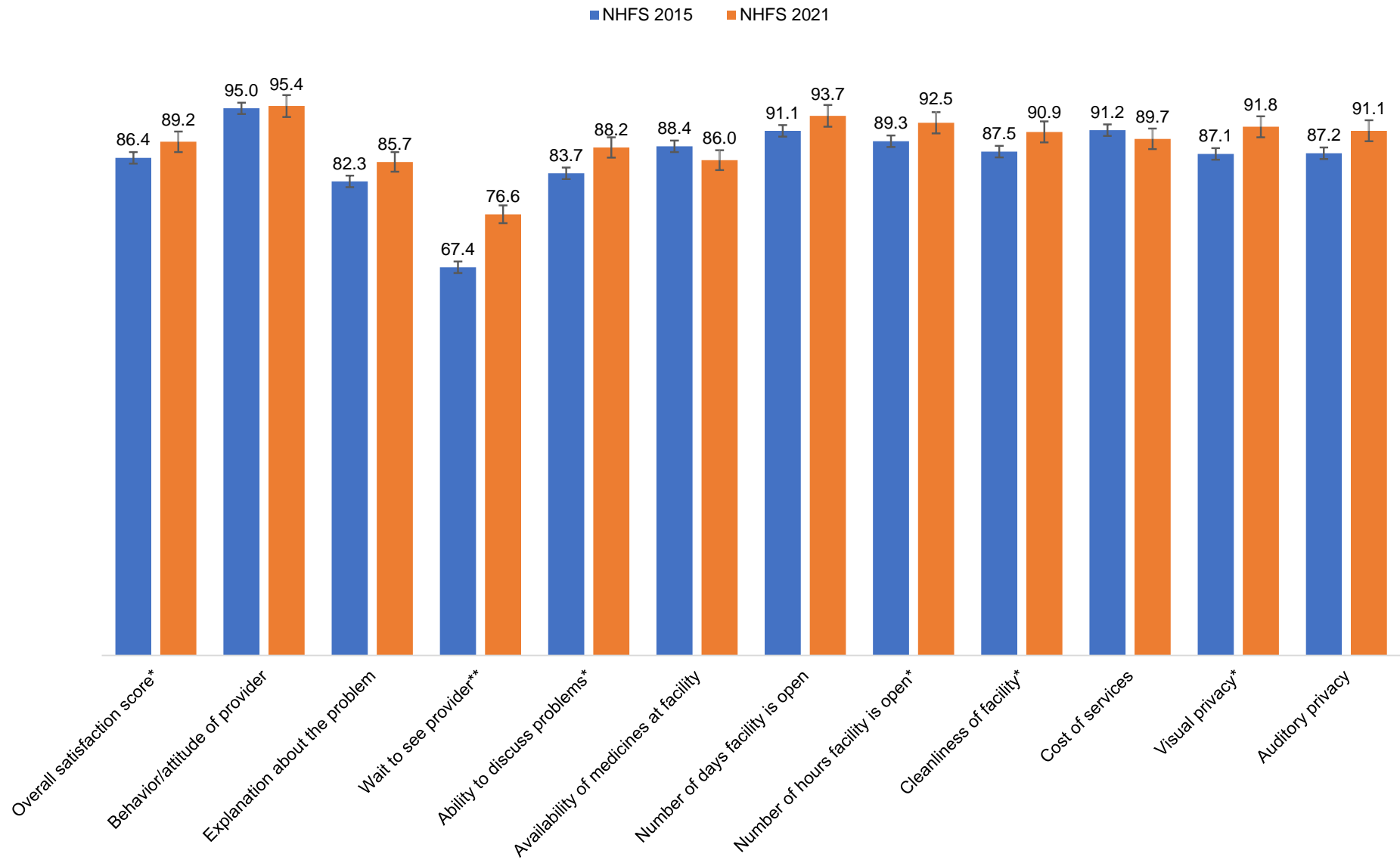
* $p < .05$, NS = not significant

Appendix 10 shows the change in domain of process of care by province. Karnali Province showed the a decrease in the client history domain (14 percentage points), with the rest of the provinces showing no significant change. Koshi and Madhesh Provinces had significant decreases in the physical examination domain (16 and 17 percentage points, respectively), with no other significant changes by province. Conversely, increases were seen in some provinces in testing capacity and counseling/prescribing medicines. Lumbini (14 percentage points) and Sudurpaschim (19 percentage points) Provinces increased in the testing capacity domain, while Sudurpaschim Province increased 10 percentage points in the counseling/prescribing medicines domain.

3.8 Client Satisfaction with ANC Services

Figure 9 shows the change in ANC clients' satisfaction for different indicators across 2015 and 2021. The overall client satisfaction score showed a modest but significant increase of 3 percentage points from 2015 to 2021. Among the 11 statements that captured client satisfaction, there were significant increases in five areas between the two surveys. Client satisfaction increased significantly in the time spent waiting to see a provider, the ability to discuss problems or concerns, the number of hours of service offered, the cleanliness of the facility, and the privacy during the examination.

Figure 9 Change in ANC clients' satisfaction for different indicators (%)



ANC = antenatal care

Asterisks in figure indicates the *p* value of the difference between the surveys with **p* < .05 and ***p* < .01.

The change in the overall client satisfaction score in ANC services by facility, providers, and clients background characteristics are presented in Table 10. By health facility types, there was a modest but significant increase in the overall satisfaction score in public hospitals, with a 4 percentage point increase between 2015 and 2021. There was no significant change in client satisfaction for the remaining health facilities between the two surveys.

By ecological zone, only the Terai Region showed a significant increase of 4 percentage points. There was no significant change in client satisfaction between the surveys for any province.

The overall satisfaction of the clients with ANC services for other facility variables, such as the occurrence of a staff management meeting at least once every 6 months, the occurrence of a meeting with management committee members at least once every 6 months, a system to determine clients' opinion, and external supervision in the last 4 months, increased significantly in 2021 when compared to 2015.

There was no significant change in client satisfaction by clients' age categories. However, there was a significant increase in the satisfaction score among the clients with no schooling and with a secondary level of education (7 and 3 percentage point increase, respectively). Only the Dalit Caste significantly increased their satisfaction between the surveys, while the change was not significant for other castes. We also observed significant increases in the overall client satisfaction among the clients who were pregnant with their first pregnancy during NHFS data collection, for first-time visit and the follow-up visits, and among clients who have seen a female provider or a nurse provider.

Table 10 The change in overall satisfaction of clients visiting facilities for ANC services, by facility characteristics and client background details

Variable	2015 NHFS		2021 NHFS		Difference	p value
	%	95% CI	%	95% CI		
Overall score	86.4	[85.6, 87.3]	89.2	[88.6, 89.9]	2.8	**
Facility types						
Public hospitals	81.8	[78.0, 83.6]	86.0	[84.6, 87.4]	4.2	*
PHCCs	87.2	[84.9, 89.6]	89.3	[86.8, 91.8]	2.1	NS
Basic health care centers (HP/UHC/CHU)	89.4	[88.2, 90.7]	91.7	[90.8, 92.7]	2.3	NS
Private hospitals	86.5	[84.6, 88.4]	87.8	[86.4, 89.1]	1.3	NS
Managing authority						
Public	86.4	[85.4, 87.4]	89.7	[88.9, 90.4]	3.3	**
Private	86.5	[84.6, 88.4]	87.8	[86.4, 89.1]	1.3	NS
Ecoregion						
Mountain	87.4	[83.0, 91.8]	90.4	[87.7, 93.1]	3.0	NS
Hill	89.6	[88.5, 90.6]	91.0	[90.1, 91.9]	1.4	NS
Terai	83.5	[82.2, 84.9]	87.8	[86.8, 88.8]	4.3	*
Province						
Koshi	80.9	[78.6, 83.3]	85.9	[84.2, 87.6]	5.0	NS
Madhesh	87.6	[85.8, 89.4]	87.7	[86.1, 89.3]	0.1	NS
Bagmati	88.3	[87.1, 89.6]	89.8	[88.5, 91.1]	1.5	NS
Gandaki	90.1	[86.3, 93.8]	91.4	[89.1, 93.8]	1.3	NS
Lumbini	85.9	[83.5, 88.4]	90.9	[89.3, 92.5]	5.0	NS
Karnali	86.4	[82.0, 90.8]	90.8	[88.0, 93.7]	4.4	NS
Sudurpaschim	85.7	[82.1, 89.3]	90.8	[89.2, 92.4]	5.1	NS
Performed regular quality assurance activities						
Yes	86.5	[85.5, 87.5]	88.9	[88.1, 89.7]	2.4	NS
Conducted staff management meeting at least once every 6 months						
Yes	86.2	[85.2, 87.1]	89.0	[88.4, 89.7]	2.8	*
Conducted meeting with management committee members at least once every 6 months						
Yes	86.1	[85.0, 87.2]	89.3	[88.5, 90.0]	3.2	*
System to determine client opinions						
Yes	85.1	[84.0, 86.1]	88.6	[87.8, 89.4]	3.5	**
External supervision in the last 4 months						
Occurred	86.2	[85.3, 87.1]	89.4	[88.7, 90.1]	3.2	**
Age						
Less than 20	87.1	[84.9, 89.2]	89.7	[87.9, 91.5]	2.6	NS
20–24	86.4	[85.2, 87.7]	89.2	[88.2, 90.2]	2.8	NS
25–29	87.7	[86.0, 89.3]	89.9	[88.7, 91.1]	2.2	NS
More than 30	83.0	[80.3, 85.8]	87.7	[85.8, 89.6]	4.7	NS
Education						
No schooling	86.1	[84.3, 90.0]	93.5	[92.2, 94.9]	7.4	***
Basic school	88.6	[87.1, 90.2]	89.8	[88.6, 91.0]	1.2	NS
Secondary	84.2	[82.7, 85.7]	87.6	[86.5, 88.7]	3.4	*
More than secondary	88.4	[86.2, 90.6]	88.3	[86.6, 89.9]	-0.1	NS
Caste						
Brahmin/Chettri	86.3	[84.7, 87.9]	88.7	[88.7, 89.9]	2.4	NS
Terai and other Madhesh caste	85.3	[83.4, 87.3]	88.1	[86.6, 89.6]	2.8	NS
Dalit	87.1	[84.8, 89.3]	92.2	[90.6, 93.8]	5.1	**
Janajati	87.0	[85.6, 88.5]	89.3	[88.0, 90.6]	2.3	NS
Muslim/others	86.7	[82.5, 90.8]	89.8	[87.4, 92.3]	3.1	NS
Pregnancy						
First pregnancy	85.9	[84.6, 87.2]	89.3	[88.4, 90.2]	3.4	**
No first pregnancy	86.9	[85.8, 88.0]	89.2	[88.2, 90.2]	2.3	NS
Time of visit						
First visit	85.3	[83.8, 86.9]	87.7	[86.6, 88.8]	2.4	*
Follow-up visit	87.0	[86.0, 88.0]	90.2	[89.4, 91.0]	3.2	**
Sex of provider						
Male	83.2	[80.4, 86.0]	82.0	[79.4, 84.6]	-1.2	NS
Female	86.8	[85.9, 87.7]	90.1	[89.5, 90.8]	3.3	**
Type of providers						
Nurse	87.3	[86.3, 88.3]	91.2	[90.5, 91.9]	3.9	**
Paramedics	87.9	[82.9, 92.9]	75.1	[67.9, 82.2]	-12.8	NS
Medical officers	82.7	[79.0, 86.3]	81.0	[76.5, 85.5]	-1.7	NS
Specialist	84.6	[82.8, 86.3]	86.8	[85.5, 88.1]	2.2	NS

ANC = antenatal care, PHCCs = primary health care centers, HP = health post, UHC = urban health center, CHU = community health unit
 * $p < .05$, ** $p < .01$, *** $p < .001$, NS = not significant

4 SUMMARY

Two national health facility surveys have been conducted in Nepal. The first survey was conducted in 2015 and the second in 2021.^{1,2} The surveys were designed to provide information on the availability of basic and essential health care services, the readiness of health facilities to offer quality services to clients, the processes of care, and client satisfaction. The main objective of this analysis is to assess the changes made in the maternal health services sector, especially to antenatal care (ANC) and delivery services provided by different types of health facilities between 2015 and 2021. The study focused on the availability of services, service readiness, infection prevention and control, the process of care, and client satisfaction.

4.1 Availability and Health Facility Readiness of ANC and Delivery Services

There was a significant increase in the availability of facilities that offer ANC services for 5 or more days a week from 85% in 2015 to 97% in 2021. However, only approximately half of the facilities offered delivery services. This remained statistically unchanged between the surveys. The overall service readiness score in providing both ANC and delivery services increased significantly between 2015 and 2021. The increase in the overall service readiness score may be due to the federalization of the country which has strengthened the capacity of the local government and the local level health facilities to respond quickly to identified gaps in health services. One area of concern is the significant decrease between the surveys in the mean score for guidelines and trained staff.

There was a significant increase in all infection prevention and control-related items for ANC and delivery services between 2015 and 2021. The largest increases in both ANC and delivery services were in the availability of alcohol-based hand disinfectant, needle destroyer/needle cutter, and medical masks.

4.2 Adherence to the Process of Care in ANC Services

The overall score for adherence to the process of care in ANC services remained significantly unchanged between 2015 and 2021. The mean score for physical examinations significantly decreased in 2021. Many of the items that should be performed by the provider during the physical examination have decreased significantly from 2015 to 2021.

For different tests conducted during ANC visits, the mean score increased significantly in 2021 compared to 2015. For counseling/prescribing medicines, there was a significant increase in the score from 2015 to 2021.

4.3 Client Satisfaction with ANC

In this study, more than 8 in 10 of the clients were satisfied with ANC services available to them in 2021. The overall score for client satisfaction significantly increased in 2021 compared to 2015. Specifically, the satisfaction with the amount of time spent waiting to see providers, the cleanliness of the facilities, the number of hours services are offered, the privacy offered, the ability of health workers to discuss problems significantly increased in 2021.

5 POLICY IMPLICATIONS

The results from this study point to several policy implications for the government of Nepal to improve maternal health care delivery. While availability of maternal health care services is nearly universal, quality of care, as measured by service readiness, process of care, and client satisfaction, has had variable trends from 2015 to 2021.

Average overall scores for both antenatal care (ANC) and delivery readiness as well as infection prevention and control increased from 2015 to 2021, showing successful intervention in readiness to provide maternal health services. While the COVID-19 pandemic and an increased focus on infection prevention and control during the may have contributed to the increased availability of infection prevention and control-related items in the health facilities,⁸ the pandemic also may have contributed to fewer training opportunities for health care providers, which can be seen in the decreases in trained ANC and delivery staff. However, since health worker training is reported by providers, there may have been bias in the responses. Training is therefore a potential area to be explored for improvement to improve overall service readiness for maternal health care.

While overall process of care did not change significantly, certain domains show areas of success and potential areas for improvement. For example, adherence to standards in the physical examination domain have declined in 2021 compared to 2015. The decline may be partially due to the COVID-19 pandemic in 2020 and 2021, which may have interrupted the physical examination service offerings. Since pregnant women are a high-risk group, some health facilities may have not conducted physical examinations due to the fear of the pregnant women about contracting Coronavirus. During that period, social distancing was highly recommended, and there may have been a subsequent decrease in the frequency of physical examinations. This is an area of focus that has potential for improvement.

All other domains of the process of care measure showed improvement between 2015 and 2021, indicating success in current interventions. The increase in testing capacity may be due to the strengthening of the health facilities that resulted from local governments being given the decision-making power to increase the capabilities of facilities that fall within their municipalities. This suggests that continuing current interventions around building testing capacity as well as strengthening client history and counseling should be continued.

Client satisfaction levels have improved from 2015 to 2021. While satisfaction is subjective and based on individual levels of awareness and expectations of health care, these increases may suggest that administration and management-related issues which were present in 2015 have been addressed. One possibility is that the COVID-19 pandemic may have contributed to the increase in satisfaction about the cleanliness of the facilities. Furthermore, the changes in federal government structure may also have had a positive impact on these improvements.

6 STRENGTHS AND LIMITATIONS

In this study, we utilized data from the nationally representative 2015 and 2021 NHFS datasets. Maternal health care measures were designed to be comparable, using a simple additive procedure rather than a weighted additive or principal component analysis approach to define the scores for both surveys. By analyzing data from two consecutive surveys, we can estimate the quantities and uncertainty of current or past events at different points in time. Our analysis can be useful for policymakers to allocate resources and prioritize issues by comparing the two surveys.

While the findings of this study will be useful, it is important to note some of the limitations of this analysis. First, due to limitations in the data, we were not able to assess process quality of care and client satisfaction with delivery services, nor readiness, process quality, or client satisfaction with postnatal care services, two critical components of maternal health care. Second, the study focused on the significant differences between the two survey points, so the variables analyzed in the study should not be taken as predictors, nor does this analysis explain the mechanisms of change. Third, process quality of care items were based on provider/client observations during service delivery. It is possible that providers may behave differently when they know they are being observed, a phenomenon known as the Hawthorne effect. Finally, client satisfaction is a very subjective measure which depends on perception, expectations, and background characteristics.

7 CONCLUSIONS

This study examined the changes in the availability of services, service readiness, and infection prevention and control readiness in the health facilities that provide ANC and delivery services. The study also examined the change in adherence to the process of care during ANC service provision and the change in client satisfaction with visiting the health facilities to receive ANC from 2015 through 2021.

Overall, these analyses found improvements observed in the availability of facilities offering ANC services for five or more days a week, along with increased overall service readiness score for both ANC and delivery services from 2015 to 2021. These improvements indicate positive strides in health care accessibility. However, the stagnation in the provision of delivery services in approximately half of the facilities signals a critical area for focused attention. Moreover, the decline in adherence to the process of care during physical examinations is concerning and demands targeted interventions to ensure comprehensive and consistent health care practices. To sustain and enhance these positive trends, health facilities should prioritize expanding delivery services, reinforcing adherence to standardized care processes, and addressing specific shortcomings identified in the physical examination procedures.

REFERENCES

1. Ministry of Health and Population, New ERA, NHSSP Nepal, and ICF. *Nepal Health Facility Survey 2015*. MoHP, New ERA, NHSSP Nepal, and ICF; 2017. <https://dhsprogram.com/pubs/pdf/spa24/spa24.pdf>
2. Ministry of Health and Population, New ERA, and ICF. *Nepal Health Facility Survey 2021*. MoHP, New ERA, and ICF; 2022. <http://mohp.gov.np/uploads/Resources/Nepal%20Health%20Facility%20Survey%202021.pdf>
3. Sapkota VP, Bhusal U, Acharya K. Trends in national and subnational wealth related inequalities in use of maternal health care services in Nepal: An analysis using demographic and health surveys (2001–2016). *BMC Public Health*. 2021;21(1), 1–14. <https://doi.org/10.1186/s12889-020-10066-z>
4. Ministry of Health and Population, New ERA, and ICF; 2023. *Nepal Demographic and Health Survey 2022*. MoHP, New ERA, and ICF; 2023. <https://mohp.gov.np/uploads/Resources/Nepal%20Health%20Facility%20Survey%202021.pdf>
5. Ministry of Health and Population, New ERA, and ICF. *Nepal Demographic and Health Survey 2022: Key Indicators Report*. MoHP, New ERA, and ICF; 2022. <https://www.newera.com.np/report/nepal-demographic-and-health-survey-2022-key-indicators/>
6. Government of Nepal, National Statistics Office. *National Population and Housing Census 2021*. NSO; 2022. <https://censusnepal.cbs.gov.np/results>
7. National Planning Commission. *Sustainable Development Goals in Nepal: Progress Assessment Report 2016–2019*. NPC; 2019. <https://doi.org/10.4324/9781351035262-5>

APPENDICES

Appendix Table 1 Composite index constructs

Index	Tracer items
Overall index of service readiness for ANC	ANC guidelines + ANC training received by the health workers in last 24 months + availability of functional BP apparatus + stethoscope + adult weighing machine + fetoscope + hemoglobin test + urine protein + urine glucose test + availability of folic acid tablet + iron and folic acid combined tablets + tetanus toxoid injection + albendazole tablets*100/13
Overall index of service readiness for delivery	Availability of guidelines + training received by the health workers who provide delivery services in last 24 months + availability of emergency transportation + functional BP apparatus + sterilization equipment, examination light + delivery pack + suction apparatus + manual vacuum extractor + manual vacuum aspiration kit + delivery bed + partograph + gloves in the facilities + availability of injectable uterotonic + magnesium sulphate*100/11
Overall index of infection prevention and control readiness for ANC and delivery services	Availability of soap and running water + alcohol-based hand disinfectant + latex gloves + needle destroyers or cutters + waste receptacles + medical masks*100/5
Overall adherence to the process of care for ANC	Clinical history include client history taken by the providers related to vaginal bleeding + swollen hand, face or extremities + headache or blurred vision + fetal movement + lower abdominal pain + vaginal discharge + convulsion/unconsciousness; physical examination includes measuring blood pressure + weighing the client + examining conjunctive/palms for anemia + examining legs/feet/hands for edema + palpating the client's abdomen for uterine height/fundal height using tape measure + palpating the client's abdomen for fetal presentation during (8 months) + listening to the client's abdomen for fetal heartbeat during (5 months) + routine test includes tests carried out in the facility on that day of visit for hemoglobin + blood grouping + any urine (glucose/protein) + providing, referring, and counseling related to HIV testing; discussing nutrition + informing the client about progress of pregnancy + discussing the importance of at least four ANC visits + prescribing or giving iron pills or folic acid or both + explaining the purpose, instructions for properly taking, or side effects of iron or folic acid + prescribing, giving, or explaining the purpose of taking tetanus diphtheria toxoid injection + prescribing, giving, or explaining the purpose of albendazole; counseling on birth preparedness + advising the client to use a skilled birth attendant and going to a health facility + and discussing early initiation or exclusive breastfeeding*100/28.
Client satisfaction with ANC	Facilities have 11 items: Waiting time to see provider + ability to discuss a problem + amount of explanation received about the problem's treatment + privacy from having others see the examination + privacy from having others hear your consultation/discussion + availability of medicines + the hours of service at facility + the number of days services are available + the cleanliness of facility + how the staff treated them + cost of services * 100/11.

Appendix Table 2 List of variables and their operational definitions

Variable	Definition/Categories
Facility types	Public hospitals, private hospitals (PHCCs), basic health care centers (BHCCs). BHCC includes health post (HP), urban health centers (UHC), and community health unit (CHU)
Managing authority	Public and private. Private includes private hospitals only.
Ecoregion	Mountain, Hill, and Terai regions
Province	Koshi, Madhesh, Bagmati, Gandaki, Lumbini, Karnali, and Sudurpaschim
Performed regular quality assurance activities	Not performed or performed. Facility reports that it routinely carries out quality assurance activities and had documentation of a recent quality assurance activity: This could be a report or minutes of a quality assurance meeting, a supervisory checklist, a mortality review, or an audit of records or registers.
Conducted staff management meeting at least once every 6 months	No or yes. Staff management meeting at least once every 6 months and observed documentation of a recent meeting
Conducted meeting with management committee member at least once every 6 months	No or yes. Management committee meeting at least once every 6 months and documentation of a recent meeting
System to determine clients' opinions	No or yes. System for determining client opinion, procedure for reviewing client opinion
External supervision in the last 3 months	Not occurred and occurred. Facility reports that it received external supervisory visit from the district, provincial, or federal office during the 4-month period before the survey.
Provider variables	Provider type: Nurse, Paramedics, Medical Officers and Specialist Provider sex: male or female Provider with training received in last 24 months
Age of the clients	<20, 20–24, 25–29 and more than 30
Caste/ethnicity	Brahmin/Chettri, Terai and other Madhesh caste, Dalits, Newar, Janajati, Muslim/others
Education of the clients	No schooling, basic education, secondary, and more than secondary
Time of visit	First visit and follow-up visit
Pregnancy	First pregnancy and subsequent pregnancy

Appendix Table 3 Background characteristics of the facilities that provide ANC and delivery services

Variables	ANC				Delivery			
	2015		2021		2015		2021	
	n	%	n	%	n	%	n	%
Total number	919		1,538		457		804	
Facility types								
Public hospitals	21	2.3	43	2.8	20	4.4	41	5.2
PHCCs	42	4.6	51	3.3	41	8.9	50	6.2
Basic health care centers (HP/UHC/CHU)	807	86.6	1,339	87.0	352	76.9	651	81.0
Private hospitals	70	6.6	105	6.8	45	9.8	62	7.6
Managing authority								
Public	859	93.5	1433	93.2	45	9.8	61	7.6
Private	60	6.6	105	6.8	413	90.2	743	92.4
Ecoregion								
Mountain	118	12.8	204	13.2	67	14.8	136	17.0
Hill	479	52.1	807	52.5	276	60.4	494	61.4
Terai	322	35.1	527	34.3	114	24.8	174	21.7
Province								
Koshi	160	17.4	259	16.8	77	16.9	134	16.7
Madhesh	161	17.5	245	15.9	39	8.6	61	7.6
Bagmati	183	19.9	316	20.5	82	18.0	151	18.8
Gandaki	118	12.9	192	12.5	66	14.4	92	11.4
Lumbini	135	14.7	235	15.3	63	13.8	136	16.9
Karnali	74	8.0	126	8.2	62	13.5	100	12.4
Sudurpaschim	89	9.7	167	10.9	67	14.7	130	16.1
Performed regular quality assurance activities								
Performed	550	59.8	901	58.6	289	63.2	514	64.0
Not performed	369	40.2	637	41.4	168	36.8	290	36.0
Conducted staff management meeting at least once every 6 months								
Yes	757	80.5	1321	84.4	382	83.6	709	88.1
No	183	19.5	243	15.6	75	16.4	95	11.9
Conducted meeting with management committee member at least once every 6 months								
Yes	605	65.9	1,102	74.0	296	64.8	619	78.2
No	314	34.1	386	26.0	161	35.2	173	21.8
System to determine client opinions								
Yes	414	45.0	832	54.0	232	50.6	523	65.0
No	505	55.0	706	46.0	226	49.4	281	35.0
External supervision in the last 4 months								
Occurred	851	92.5	1,452	94.4	433	94.8	762	94.8
Not occurred	69	7.5	86	5.6	24	5.2	42	5.2

ANC = antenatal care, PHCCs = primary health care centers, HP = health post, UHC = urban health center, CHU = community health unit

Appendix Table 4 Background characteristics of clients

Characteristics	ANC				Delivery			
	2015		2021		2015		2021	
	n	%	n	%	n	%	n	%
Age (in years)	1,498		1,966		309		546	
<20	286	19.1	246	12.5	36	11.6	60	11.0
20–24	665	44.4	882	44.9	130	42.2	234	42.9
25–29	384	26.7	555	28.2	96	31.2	166	30.4
30 and above	163	10.9	283	14.4	46	15.0	86	15.7
Education	1,509		1,966		309		546	
No schooling	335	22.2	310	15.8	48	15.4	76	13.9
Basic school	459	30.4	562	28.6	85	27.6	173	31.7
Secondary	557	36.9	860	43.7	122	39.6	232	42.5
More than secondary	158	10.4	234	11.9	54	17.5	65	12.0
Caste/ethnicity	1,509		1,966		309		546	
Brahmin/Chhetri	431	28.6	636	32.3	122	39.6	134	24.5
Terai and other Madhesh caste	344	22.8	425	21.6	51	16.7	142	26.1
Janajati	167	11.0	222	11.3	25	7.9	76	13.9
Dalit	462	30.6	556	28.3	94	30.3	163	29.8
Muslim/others	104	6.9	128	6.5	17	5.5	31	5.7
Pregnancy	1,509		1,966					
First pregnancy	762	50.5	1,077	54.8	-	-	-	-
Not first pregnancy	747	49.5	889	45.2	-	-	-	-
Time of visit								
First visit	507	33.6	764	38.9	-	-	-	-
Follow-up visit	1,002	66.4	1,202	61.1	-	-	-	-

ANC = antenatal care; A dash indicates information not available.

Appendix Table 5 Background characteristics of service providers

Characteristics	2015		2021	
	n	%	n	%
Sex				
Male	2,004	49.4	2,671	38.5
Female	2,052	50.6	4,263	61.5
Type of providers				
Nurse	1,588	39.1	2,976	42.9
Paramedics	1,733	42.7	2,375	34.2
Medical officers	192	4.7	386	5.6
Specialist	87	2.1	202	2.9
Other specialists ¹	81	2.0	151	2.2
Others ²	376	9.3	844	12.2
In-person supervision by the supervisor in the past 3 months				
Yes	1,643	40.5	3,317	47.8
No	2,414	59.5	3,617	52.2

¹ Anesthesiologist, general surgeons, pediatrician, and other specialists

² Pathologist, anesthetic assistant, laboratory technologist, officer/laboratory technician/laboratory assistant, health assistant/auxiliary health worker/public health inspector, other clinical staff

Appendix Table 6 Service readiness: Percentage of facilities that provide ANC service tracking indicators on the day of the survey

Indicators	NHFS 2015		NHFS 2021		Difference (percentage points)	p value
	%	(95% CI)	%	(95% CI)		
Overall score	57.5	[56.5, 58.2]	62.5	[61.8, 63.2]	5.0	***
Staff and guidelines (mean score)	25.3	[23.3, 27.3]	19.7	[18.3, 21.1]	-5.6	**
Guidelines for ANC	25.0	[21.2, 29.2]	10.5	[8.2, 13.2]	-15.5	***
Staff trained in ANC	25.5	[22.0, 29.4]	28.9	[25.6, 32.4]	3.4	NS
Equipment (mean score)	89.9	[88.5, 91.3]	95.0	[94.4, 95.6]	5.1	***
BP apparatus	87.4	[83.8, 90.3]	97.6	[96.1, 98.5]	10.2	***
Stethoscope	90.8	[87.5, 93.4]	98.2	[96.9, 99.0]	7.4	***
Adult weighing machine	87.5	[83.9, 90.3]	95.4	[93.5, 96.8]	7.9	***
Fetoscope	93.9	[91.2, 95.7]	88.8	[86.2, 90.9]	5.1	**
Testing capacity (mean score)	14.4	[12.2, 16.5]	27.1	[24.9, 29.2]	12.7	***
Hemoglobin	14.5	[12.7, 16.5]	26.3	[23.4, 29.3]	11.8	***
Urine protein	15.2	[13.2, 17.5]	28.2	[25.4, 29.3]	13.0	***
Urine glucose	13.4	[11.7, 15.2]	26.7	[23.8, 29.8]	13.3	***
Medicines (mean score)	73.0	[72.1, 73.9]	77.9	[77.1, 78.8]	4.9	***
Folic acid tab	10.3	[8.3, 12.8]	31.3	[28.0, 34.8]	21.0	***
Iron and folic acid combined tab	90.8	[88.0, 93.0]	95.7	[94.3, 96.8]	4.9	***
TT	93.3	[90.8, 95.2]	87.0	[84.5, 89.2]	-5.7	***
Albendazole tab	97.6	[96.2, 98.5]	97.8	[96.8, 98.5]	0.2	NS

ANC = antenatal care; BP = blood pressure

** $p < .01$, *** $p < .001$, NS = not significant

Appendix Table 7 Service readiness: Changes in each domain of readiness by province

Domains of service readiness	NHFS 2015		NHFS 2021		Difference (percentage points)	p value
	%	(95% CI)	%	(95% CI)		
Staff and guidelines (mean score)	25.3	[23.3, 27.3]	19.7	[18.3, 21.1]	-5.6	**
Koshi	18.1	[13.9, 22.2]	21.7	[18.4, 25.1]	3.6	NS
Madhesh	21.9	[17.7, 26.1]	22.6	[18.7, 26.5]	0.7	NS
Bagmati	20.3	[16.0, 24.6]	14.4	[11.5, 17.2]	-5.9	NS
Gandaki	23.4	[18.5, 28.4]	17.3	[13.4, 21.0]	-6.1	NS
Lumbini	39.8	[34.1, 45.4]	22.2	[18.3, 26.0]	-17.6	***
Karnali	30.5	[22.3, 38.6]	15.3	[11.0, 19.7]	-15.2	*
Sudurpaschim	31.7	[24.7, 38.7]	24.8	[20.6, 29.1]	-6.9	NS
Equipment (mean score)	89.9	[88.5, 91.3]	95.0	[94.4, 95.6]	5.1	***
Koshi	87.6	[84.1, 91.1]	93.3	[91.3, 95.2]	5.7	NS
Madhesh	89.7	[86.8, 92.7]	90.3	[88.5, 92.1]	0.6	NS
Bagmati	89.9	[86.8, 93.0]	95.6	[94.2, 97.0]	5.7	*
Gandaki	92.6	[89.2, 96.0]	97.9	[96.9, 98.9]	5.5	NS
Lumbini	93.5	[90.5, 96.4]	97.3	[95.9, 98.7]	3.8	NS
Karnali	87.2	[81.1, 93.3]	93.8	[91.3, 96.2]	6.6	NS
Sudurpaschim	87.5	[82.3, 92.7]	97.8	[96.5, 99.0]	10.3	**
Testing capacity	14.4	[12.2, 16.5]	27.1	[24.9, 29.2]	12.7	***
Koshi	13.1	[8.1, 18.1]	36.0	[30.4, 41.5]	22.9	***
Madhesh	11.9	[6.9, 16.8]	14.7	[10.4, 18.8]	2.8	NS
Bagmati	21.1	[15.5, 26.8]	34.0	[28.8, 39.1]	12.9	***
Gandaki	14.0	[8.2, 19.9]	25.1	[19.5, 30.7]	11.1	**
Lumbini	12.5	[6.9, 18.0]	29.0	[23.5, 34.5]	16.5	**
Karnali	12.2	[5.6, 18.9]	13.5	[7.9, 19.0]	1.3	NS
Sudurpaschim	12.2	[5.6, 18.8]	28.1	[21.5, 34.7]	15.9	**
Medicines (mean score)	73.0	[72.1, 73.9]	77.9	[77.1, 78.8]	4.9	***
Koshi	73.5	[71.5, 75.5]	82.3	[80.2, 84.4]	8.8	***
Madhesh	63.7	[60.8, 66.5]	76.1	[73.6, 78.6]	12.4	***
Bagmati	75.6	[72.5, 77.5]	79.4	[77.2, 81.6]	3.8	*
Gandaki	77.5	[76.1, 79.0]	78.0	[75.6, 80.4]	0.5	NS
Lumbini	74.6	[72.8, 76.4]	76.8	[75.0, 78.6]	2.2	NS
Karnali	75.6	[72.7, 78.4]	74.6	[72.2, 77.0]	1.0	NS
Sudurpaschim	74.5	[71.8, 77.1]	75.2	[73.2, 77.1]	0.7	NS

ANC = antenatal care; BP = blood pressure

** $p < .01$, *** $p < .001$, NS = not significant

Appendix Table 8 Service readiness: Percentage of facilities that provide delivery service tracking indicators on the day of the survey

Indicators	NHFS 2015		NHFS 2021		Difference (percentage points)	p value
	%	(95% CI)	%	(95% CI)		
Overall score	66.4	[65.1, 67.7]	72.1	[71.3, 72.9]	5.7	***
Guidelines and trained staff (mean score)	29.0	[26.1, 31.9]	21.2	[19.2, 23.1]	-7.8	**
Guidelines	21.8	[17.3, 27.1]	12.8	[9.6, 16.7]	-9.0	**
Staff trained	36.1	[30.9, 41.7]	29.6	[25.1, 34.5]	-6.5	NS
Supplies and equipment (mean score)	70.6	[69.1, 72.0]	79.3	[78.4, 80.1]	8.7	***
Emergency transportation	62.6	[56.9, 68.0]	82.0	[77.7, 85.6]	19.4	***
BP apparatus	84.4	[79.5, 88.4]	95.8	[93.0, 97.4]	11.4	***
Sterilization equipment	97.1	[93.8, 98.7]	99.9	[99.5, 100]	1.8	***
Examination light	63.3	[57.5, 68.7]	94.9	[92.3, 96.7]	30.6	***
Delivery pack	92.4	[88.3, 95.2]	97.7	[95.8, 98.8]	5.3	**
Suction apparatus	63.5	[57.9, 68.7]	66.9	[61.9, 71.6]	3.4	NS
Manual vacuum extractor	22.7	[19.2, 26.6]	24.2	[20.4, 28.4]	1.5	NS
Vacuum aspiration kit	21.4	[18.0, 25.2]	23.9	[20.2, 28.0]	2.5	NS
Delivery bed	96.3	[93.5, 98.0]	98.7	[97.0, 99.5]	2.4	*
Partograph	80.0	[75.0, 84.3]	90.4	[87.4, 92.7]	10.4	***
Gloves	92.5	[89.0, 95.0]	97.5	[95.3, 98.6]	5.0	**
Medicines (mean score)	80.2	[77.2, 83.1]	83.8	[82.0, 85.6]	3.6	NS
Injectable uterotonic	88.2	[84.0, 91.4]	97.0	[94.9, 98.3]	8.8	***
Magnesium sulphate	72.2	[66.6, 77.1]	70.7	[65.6, 75.2]	-1.5	NS

BP = blood pressure

* $p < .05$, ** $p < .01$, *** $p < .001$, NS = not significant

Appendix Table 9 Process of care for ANC services: Percentage of ANC clients observed to have received each item of care on the day of the survey

Indicators	NHFS 2015		NHFS 2021		Difference (percentage points)	p value
	%	(95% CI)	%	(95% CI)		
Overall score	32.5	[31.5, 33.6]	30.4	[29.4, 31.4]	-2.1	NS
Client history (mean score)	19.0	[18.0, 20.0]	17.9	[17.1, 18.8]	-1.1	NS
Vaginal bleeding	11.6	[9.2, 14.6]	17.0	[14.3, 20.1]	5.4	**
Swollen hand, face, or extremities	22.6	[18.9, 26.9]	17.2	[14.1, 20.8]	-5.4	*
Headache or blurred vision	13.7	[10.9, 17.1]	13.0	[10.5, 16.1]	-0.7	NS
Fetal movement	33.4	[28.9, 38.1]	24.8	[21.4, 28.6]	-8.6	**
Lower abdominal pain	32.0	[28.0, 36.2]	31.4	[27.8, 35.3]	-0.6	NS
Vaginal discharge	13.1	[10.4, 16.4]	16.8	[13.7, 20.4]	-3.7	NS
Convulsion/unconsciousness	6.9	[5.0, 9.5]	5.2	[3.7, 7.4]	-1.7	NS
Physical examination (mean score)	60.5	[58.7, 62.2]	53.4	[51.6, 55.5]	-7.1	**
Blood pressure	81.1	[75.0, 86.0]	86.9	[83.1, 90.0]	5.8	NS
Weigh the client	74.0	[67.3, 79.7]	81.9	[77.5, 85.6]	7.9	*
Examine conjunctiva/palms for anemia	36.9	[32.0, 42.2]	20.7	[17.2, 24.7]	-16.2	***
Examine legs/feet/hands for edema	27.8	[23.6, 32.5]	19.9	[15.2, 25.7]	-7.9	*
Palpate the client's abdomen for uterine height/fundal height using tape measure	17.5	[14.1, 21.6]	15.2	[10.2, 22.0]	-2.5	NS
Palpate the client's abdomen for fetal presentation (8 months)	86.5	[82.1, 89.9]	70.9	[64.2, 76.8]	-15.6	***
Listen to the client's abdomen for fetal heartbeat (5 months)	81.2	[77.1, 84.7]	69.2	[63.9, 74.1]	-12.0	***
Testing capacity (mean score)	34.8	[32.5, 37.1]	42.2	[40.1, 44.2]	7.4	*
Hemoglobin test	36.2	[31.9, 40.7]	44.3	[40.0, 48.7]	8.1	*
Blood grouping	35.9	[31.6, 40.5]	44.1	[39.8, 48.5]	8.2	*
Any urine test (glucose/protein)	32.2	[27.6, 37.2]	38.0	[34.0, 42.2]	5.8	NS
Counseling/prescribing medicines	25.7	[24.7, 26.6]	29.1	[28.3, 30.0]	3.4	*
Provided or referred counseling related to HIV test	10.2	[7.9, 13.1]	15.1	[12.2, 18.5]	4.9	*
Discussed nutrition	48.1	[43.2, 53.1]	55.1	[50.0, 60.1]	7.0	NS
Informed the client about progress of pregnancy	32.3	[27.6, 37.3]	39.1	[33.7, 44.7]	6.8	NS
Discussed the importance of at least 4 ANC visits	18.6	[15.5, 22.2]	28.1	[24.3, 32.3]	9.5	***
Prescribed or gave iron pills or folic acid (IFA) or both	62.7	[57.4, 67.7]	67.8	[63.1, 72.1]	5.1	NS
Explained the purpose, how to take, and side effects of iron or folic acid	31.0	[26.6, 35.8]	37.5	[33.6, 41.6]	6.5	*
Prescribed, gave, or explained the purpose of taking tetanus diphtheria toxoid (TD) injection	28.9	[25.5, 32.6]	30.6	[27.2, 34.3]	1.7	NS
Prescribed, gave, or explained the purpose of albendazole	21.7	[18.6, 25.2]	24.3	[21.3, 27.7]	2.6	NS
Counseled on birth preparedness	17.0	[13.3, 21.6]	14.8	[12.3, 17.8]	-2.2	NS
Advised the client to use a skilled birth attendant, go to a health facility	10.3	[7.9, 13.3]	7.1	[5.4, 9.3]	3.2	NS
Discussed early initiation or exclusive breastfeeding	1.6	[0.8, 3.1]	1.0	[0.4, 2.6]	-0.6	NS

ANC = antenatal care

* $p < .05$, ** $p < .01$, *** $p < .001$, NS = not significant

Appendix Table 10 Process of care for ANC services: Changes in each domain of process of care by province

Domains of process of care	NHFS 2015		NHFS 2021		Difference (percentage points)	p value
	%	(95% CI)	%	(95% CI)		
Client history (mean score)	19.0	[18.0, 20.0]	17.9	[17.1, 18.8]	-1.1	NS
Koshi	19.1	[17.0, 21.3]	17.7	[15.4, 20.0]	-1.4	NS
Madhesh	8.9	[7.3, 10.5]	12.4	[10.7, 14.0]	3.5	NS
Bagmati	23.4	[21.5, 25.2]	21.7	[19.9, 23.6]	-1.7	NS
Gandaki	19.7	[15.4, 24.1]	22.2	[18.5, 25.9]	-2.5	NS
Lumbini	20.4	[17.6, 23.1]	16.5	[14.7, 18.4]	-3.9	NS
Karnali	31.2	[26.2, 36.2]	17.3	[14.0, 20.5]	-13.9	***
Sudurpaschim	19.5	[15.0, 24.0]	21.9	[19.0, 24.9]	-2.4	NS
Physical examination (mean score)	60.5	[58.7, 62.2]	53.4	[51.6, 55.5]	-7.1	**
Koshi	64.7	[60.1, 69.2]	48.8	[44.3, 53.2]	-15.9	**
Madhesh	62.3	[58.2, 66.5]	45.6	[41.4, 49.7]	-16.7	*
Bagmati	57.8	[54.6, 60.9]	62.8	[59.8, 65.8]	5.0	NS
Gandaki	59.0	[53.1, 64.8]	57.0	[50.2, 63.9]	-2.0	NS
Lumbini	61.5	[56.3, 66.7]	54.1	[49.2, 58.9]	-7.4	NS
Karnali	63.9	[57.4, 70.4]	57.5	[51.5, 63.6]	-6.4	NS
Sudurpaschim	56.4	[50.4, 62.4]	50.9	[44.9, 56.9]	-5.5	NS
Testing capacity (mean score)	34.8	[32.5, 37.1]	42.2	[40.1, 44.2]	7.4	*
Koshi	38.5	[33.2, 43.8]	41.3	[36.4, 46.2]	2.8	NS
Madhesh	28.4	[23.5, 33.2]	43.7	[39.4, 48.0]	15.3	NS
Bagmati	42.7	[38.5, 47.0]	38.2	[33.8, 42.6]	-4.5	NS
Gandaki	40.8	[31.4, 50.1]	51.3	[43.0, 59.6]	10.5	NS
Lumbini	26.2	[20.7, 31.7]	39.8	[35.1, 44.5]	13.6	*
Karnali	18.3	[8.2, 28.5]	34.2	[25.5, 43.0]	15.9	NS
Sudurpaschim	29.6	[20.9, 38.3]	49.0	[43.0, 55.0]	19.4	**
Counseling/prescribing medicines	25.7	[24.7, 26.6]	29.1	[28.3, 30.0]	3.4	*
Koshi	27.1	[24.7, 29.6]	25.8	[23.5, 28.1]	-1.3	NS
Madhesh	24.3	[22.4, 26.2]	27.2	[25.5, 28.8]	2.9	NS
Bagmati	22.4	[20.9, 24.0]	25.1	[23.3, 26.8]	2.7	NS
Gandaki	26.2	[22.7, 29.7]	28.8	[25.4, 32.2]	2.6	NS
Lumbini	31.4	[28.7, 34.0]	31.3	[29.1, 33.4]	-0.1	NS
Karnali	23.9	[19.4, 28.4]	29.0	[25.8, 32.1]	5.1	NS
Sudurpaschim	29.4	[25.7, 33.1]	39.5	[37.1, 42.0]	10.1	***

ANC = antenatal care; BP = blood pressure

** $p < .01$, *** $p < .001$, NS = not significant