FNJN

İSTANBUL UNIVERSITY CERRAHPAŞA

Florence Nightingale Journal of Nursing

DOI: 10.5152/FNJN.2021.21013

Research Article

Nurses and Midwives Human Resource for Health and Their Education in India: A Situational Analysis

Manoja Kumar Das, Deepak Singh

Division of Public Health, The INCLEN Trust International, New Delhi, India

ORCID IDs of the authors: M.K.D. 0000-0002-8559-5837, D.S. 0000-0003-1591-4713

Cite this article as: Das, M. K. & Singh, D. (2022). Nurses and midwives human resource for health and their education in India: A situational analysis. *Florence Nightingale Journal of Nursing, 30*(1), 9-17.

Abstract

AIM: This study aimed to the status of the nurses and midwives human resource and training institutes in India and variations across states.

METHOD: This cross-sectional study collected information available from open sources (all data for the states) and supplemented with grey literature, as of 2019. The census population data were used for estimating the nurses and midwives dentistry. There was no sample selection. All the available information for the 30 states and six Union Territories were included.

RESULTS: The auxiliary nurses and midwives (ANMs) density varied from 0.7 (Bihar and Telangana) to 26.6 (Andhra Pradesh) in states and 6.6 per 10,000 population at a national level. The registered nurses and midwives (RN/RM) density varied from 0.8 (Bihar) and 0.9 (Jharkhand) to 78.7 (Kerala) in states and 16.1 per 10,000 population at a national level. In 2019, there were 1890 ANM training schools, 3155 general nurses and midwives (GNM) training colleges, and 1958 Bachelor of Science (BSc) nursing training colleges in India. These institutions had 54,948 ANM, 227,370 GNM/BSc and 40,795 postgraduate nursing seats. With the current capacity, the nurses and midwives deficit can only be met in a 6–12 years period.

CONCLUSION: India suffers from severe nurses and midwives shortage compared to the global norms with wide variations across the states. Increasing the training institution's number and seats are needed to meet the norms.

Keywords: Human resources for health, India, nurses and midwives, nurses-population density, nursing education

Introduction

India has made significant progress in health indicators in recent times. In 2018, the crude birth and death rates were 20 (11% decline) and 6.2 (15% decline) per 1000 populations, respectively (Registrar General of India, 2020). Over the same period, the infant mortality rate (IMR) reached 32 per 1000 live births (decline by 36%) and the maternal mortality ratio (MMR) reached 113 per 100,000 live births (decline by 47%) (Registrar General of India, 2020). But this progress fell short to achieve the IMR and MMR goals of the National Rural Health Mission (NRHM) (IMR <30 per 1000 live births and MMR <100 per 10,000 live births by 2010) (Programme Evaluation Organization & Planning Commission, 2011) and the 12th five-year plan (IMR <25 per 1000 live births and MMR <100 per 10,000 live births by 2017) (Planning Commission, 2013). The human resource for health (HRH) has a significant contribution to these changes in health indicators, along with the infrastructural, systemic, and financial interventions (High Level Expert Group on Universal Health Coverage, 2010).

Healthcare (curative and preventive) services in India are delivered by a wide range of professionals including doctors, nurses and midwives, paramedics, and support service providers. Additionally, there are dentists, Ayush doctors (under the indigenous Indian system of medicine including Ayurveda, Homeopathy, Unani, Siddha and Yoga), who provide clinical care. Nurses and midwives include the community level functionaries (auxiliary nurses and midwives, ANMs), general nurses and midwives (GNMs), graduate nurses, nurses with postgraduate and diploma in specialties. Additionally, physiotherapists, psychologists, paramedical technicians, other support functionaries contribute to India's HRH. Additionally, there are community-level functionaries, accredited social health activists (ASHAs) who assist in health service delivery from 2005 to 2006 onwards. Usually, the Ayush doctors and ASHAs are not included in the World Health Organization's (WHO) HRH index estimation (High Level Expert Group on Universal Health Coverage, 2010).

WHO has revised the minimum HRH norms from 22.8 (2006) to 44.5 (2016) health workers per 10,000 population to achieve sustainable development goals (SDGs) and universal health coverage (UHC) (World Health Organization, 2017b). The revised norm is almost double of India's current healthcare workforce status. The Global Health Workforce Alliance

Corresponding Author: Manoja Kumar Das
E-mail: manoj@inclentrust.org

Received: January 13, 2021
Accepted: May 31, 2021

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categorized India as one of the "most severe crisis" from the HRH aspect (Global Health Workforce Alliance & World Health Organization, 2013).

India has a large network of 160,713 health sub-centers (HSCs), 34,705 primary health centers (PHCs), 5863 community health centers (CHCs), 438 sub-district hospitals (SDHs), and 756 district hospitals (DHs) (as of March 2020) (Ministry of Health and Family Welfare, 2020). Under the Ayushman Bharat scheme, over 50,000 health wellness centers (HWCs, up-gradation of some HSCs and PHCs) have been established till now at the HSCs and PHCs and target for 150,000 HCWs by December 2020, to facilitate comprehensive primary healthcare services delivery (Ministry of Health & Family Welfare, 2018).

According to the government information, as of January 2019, the doctor: population ratio was 1:1457 for allopathic doctors and nurse: population ratio was 1:675, which was lower than the norms suggested by WHO (1:1000 for doctors and 3:1000 for nurses/midwives) (Ministry of Health and Family Welfare, 2019). Nurses and midwives (34.4%) and ANMs (14.1%) constitute the major share of the HRH in India (2016–2017) (Nair, 2019). In 2010, a high-level expert group (HLEG) on UHC in India recommended several strategies for addressing the HRH gaps to achieve the UHC including two ANMs and a nurse practitioner at HSCs, increasing the number of nursing and midwifery training institutions and career progression for nurses and midwives along with the allopathic and Ayush doctors and other allied health workforce (High Level Expert Group on Universal Health Coverage, 2010). Since then several efforts to augment the HRH production in India including nurses and midwives have been initiated by the Government of India (Ministry of Health and Family Welfare, 2019).

There is a need to document the status of the nurses and midwives availability and the training capacity of the institutions in India for appropriate planning at national and state levels. The aim of the study was "what is the present status of the nurses and midwives HRH, the training capacity of the institutions in India and the trend since 2004?" This report presents the current status of the nurses and midwives HRH and their education opportunities in India and the changes over the last two decades.

Research Questions

1. What is the status of the nurses and midwives HRH in India?
2. What is the profile of the nurses and midwives educational institutions and their training capacity in India?

Methods

Study Design

This study is a descriptive and cross-sectional situational analysis.

Sample

There was no sample selection. This study collected all available data for the nurses and midwives HRH status for all the states, Union Territories and national level as of 2019 and their educational institutes and seats during 2004 and 2019. The study included data for the national and states level of India.

Data Collection

In this study, the health management and information system reports of the Ministry of Health and Family Welfare, Government of India for the period 2019-2020 (as of June 2020) were used. The list of nurse and midwife training institutions, courses and student intake capacity available from the Nursing Council of India (INC, website: https://www.indiannursingCouncil.org; last updated 15 December 2020) were manually compiled. The data for nurses and midwives for India and different states were extracted from other published literature and grey literature available in the open domain (the keywords used: nurses, nursing, midwife, midwives, nursing council, registration, education, courses, schools, workforce, human resources, shortage, migration, India, and states). The population of India and the states for 2019 were estimated using the Census 2011 data and decadal growth rate (Registrar General & Census Commissioner, India, 2013). Both authors participated in document search, data collection, and analysis.

Data Collection Tools

The data from various sources were abstracted and collated according to the types of courses, institutions, states, and years.

Statistical Analysis

Descriptive analysis was undertaken for the information extracted from different sources using excel and STATA 15.0 (Stata Corporation, Texas, USA). The data were presented as absolute numbers, percentages, average, standard deviation, minimum and maximum for the states, Union Territories and national level. The information for the year 2019–2020 was used for estimation of the nurses and midwives density per 10,000 population for the personnel in position and seats for training at state and national levels. Similarly, for different courses, the seat index per 10,000 population at state and national levels was also estimated.

Ethical Considerations

As data used for this study were obtained from publicly available sources and not linked to any identifiable individual, explicit individual consent was not required. The protocol was reviewed by INCLEN Independent Ethics Committee (Ref no-22, Date January 20, 2020) and exempted.

Results

Nurses and Midwives Density

According to the available information from the Government of India (2018), there were 872,693 ANMs, 56,602 lady health visitors (LHVs; supervisors of ANMs with 6 months additional training), and 2,108,919 RNs/RMs. As reflected in Table 1, at the national level, the population densities for ANM, RN/RM, LHV, and all nurses and midwives pooled were 6.6, 16.1, 0.4, and 23.2 per 10,000 population. The figures for some union territories (UTs) were not available. The ANM density per 10,000 population varied from 0.7 in Bihar and Telangana to 26.6 in Andhra Pradesh. From these figures, it appears that there were discrepancies in the available numbers for the states Andhra Pradesh

and Telangana, which were separated in 2014. The RN/RS density per 10,000 population varied from 0.8 in Bihar and 0.9 in Jharkhand to 78.7 in Kerala. The LHV density per 10,000 population varied from zero in 10states to 2.4 in Kerala, and LHV is considered as a dying cadre. At pooled level, the nurses and midwives density per 10,000 population was lowest in Bihar (1.6) and highest in Kerala (89.9). Eleven states had the nurses and midwives density above three per 1000 population, meeting the WHO norm (Table 1, 2).

Nurses and Midwives Education

According to the INC, there are several nurse and midwifery courses being offered in India including certificate, diploma, degree (graduate, postgraduate, and PhD) programs, some are awarded by the nursing boards and others by the universities (Table 3). The ANM, GNM, and BSc nursing courses are the major ones offered. According to the level of engagement and function in the public health system, the ANMs and LHVs primarily function at the HSC and PHCs. The GNMs usually function as staff nurses and midwives at the PHC, CHC, SDH, and DHs. The MSc, MPhil, and PhD degree holders are usually engaged in teaching institutes and medical or dental colleges. The private sector health institutions also engage the nurses usually with GNM and BSc degrees, while the super-specialty hospitals may engage the PBBSc and additional certificate course qualified nurses. The BSc, PBBSc, and postgraduate degree holders usually also migrate to other countries.

The INC and the 29 state nursing councils (SNCs) oversee nursing education in the country and respective states. The SNCs register the students passing out from the institutions in their respective states. No SNC exists in the UTs and state of Nagaland. In 2019, there were 1890 ANM training schools, 3155 GNM training colleges, and 1958 BSc nursing training colleges in India. Additionally, 765, 217, and 650 colleges offered PBBSc certificate, PBBSc diploma in nursing, and MSc courses. Between 2004 and 2019, in India, the numbers of nursing institutions have increased by 8.8 times for ANM courses, 4.6 times for GNM courses, 10.6 times for BSc courses, 20.7 times for PBBSc courses, and 20.3 times for MSc courses (Figure 1). The rise in institutions has been higher from 2010 onwards. The rise in MPhil, PhD, and other specialty courses was very small compared to the others. The rise in the number of institutions was higher in some states (Assam, Bihar, Chhattisgarh, Delhi, Gujarat, Haryana, Jammu and Kashmir, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Punjab, Tamil Nadu, and Uttar Pradesh), especially for the ANM, GNM, and BSc courses (Supplementary Tables 1-6).

In 2019, the institutions had 54,948 ANM seats, 227,370 GNM or BSc nursing seats, and 40,795 post-BSc or postgraduate courses. While ten states had >10,000 GNM/BSc seats, only three states had >5000 ANM seats. Six states had >2000 seats in regular postgraduate or diploma or certificate nursing courses. Table 2 summarizes the nurses and midwifery course seat index at the state and national level for the year 2019.

Adequacy of the Institutions and Student Intake Capacity

According to the HLEG for UHC estimate, the ANM cadre requirement for 2022 was 832,178. According to the INC, the annual ANM intake capacity was 39,325 in 2019. Considering the availability of 80% of the registered ANMs in service, 80% of the newly trained ANMs join public health service and annual attrition of 3% due to various reasons, the estimated time needed to meet the estimates is 12 years. The HLEG estimated the nursing cadre requirement for 2022 as 1,616,227. According to the INC, the annual GNM and BSc nursing intake capacity was 177,368 in 2019. Considering the availability of the registered nurses as 60% (adjusting for the migration, joining private sector) and 60% of the newly trained nurses joining public health services and 3% annual attrition due to various reasons, the estimated time needed to meet the estimates is 5–6 years. With population growth, the public health infrastructure shall also need expansion. Additionally, the augmentation of public health infrastructure with HWCs has escalated the HRH demand. With these expansions, the HRH demands are expected to multiply by at least 125%. Considering the expansion of private sector health infrastructure, the HRH, especially the nursing cadre training shall need augmentation to meet the demand in coming years.

Nurses and Midwifery Journals from India

On searching, 21 nurses and midwifery journals published from India were retrieved (Table 4). None of these were indexed in PubMed. Six of these were published by Tamil Nadu Nurses and Midwives Council.

Discussion

This paper presents the status of the nurses and midwives cadre HRH and the training institutes for nurses and midwives in India as of 2019. This paper estimated the nurses and midwives density for the states in India and the national level. According to the estimated nurses and midwives density, eleven states met the WHO norm and six states had < 1 nurse/midwife per 1000 population. The status of union territories (except Delhi) and Jammu and Kashmir were not available.

It was observed that considering the public health infrastructure, there is a gross deficit in the existing nursing cadre HRH in India. The available nurses and midwives density in India was 1:2000 (0.5 per 1000 population), which is low compared to the density in the lower middle (1.7 per 1000 population), upper-middle (2.7 per 1000 population), and high income (7.1 per 1000 population) countries in 2013 (World Health Organization, 2017a). The Indian nurses and midwives density is lower than the overall density in the WHO Southeast Asia region (1.5 per 1000 population) (World Health Organization, 2017a).

According to the National Sample Survey Organization survey (India, 2016), about 78.7% of the nurses and midwives were registered. The HRH density per 10,000 population for the nurses and midwives was 12.7 and for the ANMs were 6.0 at the national level. The report also noted that 58% of the nurses and midwives had inadequate qualifications or training in India. After adjusting for the inadequate qualifications, the nurses and midwives density per 10,000 population dropped from 12.7 to 4.2. While 44.8% of the nurses and midwives were in the public sector, 55.3% were in the private sector (Karan et al., 2019).

Table 1.
Nursing Professional Density in States and Union Territories of India

States and Union Territories	Number of Nurses and midwives[a]				Population (in Millions)[b]	Nurses and Midwives Density (per 10,000 Population)[c]			
	ANM (n)	RN/RM (*n*)	LHV (*n*)	Total (*n*)		ANM	RN/RM	LHV	Pooled
States									
Andhra Pradesh	138,435	232,621	2480	373,536	52.032	26.6	44.7	0.5	71.8
Arunachal Pradesh	1158	1094	35	2287	1.493	7.8	7.3	0.2	15.3
Assam	27,925	22,388	353	50,666	34.043	8.2	6.6	0.1	14.9
Bihar	8624	9413	511	18,548	118.333	0.7	0.8	0.0	1.6
Chhattisgarh	133,29	13,048	1352	27,729	28.468	4.7	4.6	0.5	9.7
Delhi	4516	67,416	0	71,932	19.561	2.3	34.5	-	36.8
Goa	-	-	-	-	1.534				
Gujarat	48,517	123,170	0	171,687	67.319	7.2	18.3	-	25.5
Haryana	26,607	30,430	694	57,731	28.401	9.4	10.7	0.2	20.3
Himachal Pradesh	11,673	20,934	500	33,107	7.268	16.1	28.8	0.7	45.6
Jammu & Kashmir*	-	-	-	-	13.427	-	-	-	-
Jharkhand	4755	3310	142	8207	37.047	1.3	0.9	0.0	2.2
Karnataka	54,039	231,643	6840	292,522	65.450	8.3	35.4	1.0	44.7
Kerala	30,706	275,544	8507	314,757	35.003	8.8	78.7	2.4	89.9
Madhya Pradesh	39,563	118,793	1731	160,087	81.471	4.9	14.6	0.2	19.6
Maharashtra	71,079	139,247	671	210,997	121.391	5.9	11.5	0.1	17.4
Manipur	3877	8798	0	12,675	3.080	12.6	28.6	-	41.2
Meghalaya	1846	6637	206	8,689	3.200	5.8	20.7	0.6	27.2
Mizoram	2157	3634	0	5791	1.184	18.2	30.7	-	48.9
Nagaland	-	-	-	-	2.134	-	-	-	-
Orissa	62,159	75575	238	1,37,972	43.550	14.3	17.4	0.1	31.7
Punjab	23,029	76,680	2584	102,293	29.699	7.8	25.8	0.9	34.4
Rajasthan	108,688	200,171	2732	311,591	76.592	14.2	26.1	0.4	40.7
Sikkim	216	1144	0	1360	0.659	3.3	17.4	-	20.6
Tamil Nadu	58,411	293,105	112,47	362,763	75.460	7.7	38.8	1.5	48.1
Telangana	2762	9397	0	12,159	37.030	0.7	2.5	-	3.3
Tripura	2232	4140	148	6520	3.963	5.6	10.4	0.4	16.5
Uttar Pradesh	60,258	74,777	2763	137,798	223.003	2.7	3.4	0.1	6.2
Uttarakhand	2401	2613	14	5028	11.055	2.2	2.4	0.0	4.5
West Bengal	63,731	63,197	128,54	1,39,782	96.500	6.6	6.5	1.3	14.5
Union Territories									
Andaman and Nicobar Island	-	-	-	-	0.396	-	-	-	-
Chandigarh	-	-	-	-	1.170	-	-	-	-
Dadra and Nagar Haveli	-	-	-	-	0.525	-	-	-	-
Daman and Diu	-	-	-	-	0.395	-	-	-	-
Lakshadweep	-	-	-	-	0.067	-	-	-	-
Puducherry	-	-	-	-	1.481	-	-	-	-
Total	183,785	198,143	17,989	399,917	1323.384	1.9	5.0	0.1	7.0

Note: *Recently divided into two Union Territories, Jammu and Kashmir and Ladakh.
[a]Data source: Ministry of Health and Family Welfare, Government of India (July 2, 2019).
[b]Estimated population for 2019 using the Census 2011 and decadal growth rate.
[c]Estimated nurses and midwives density.

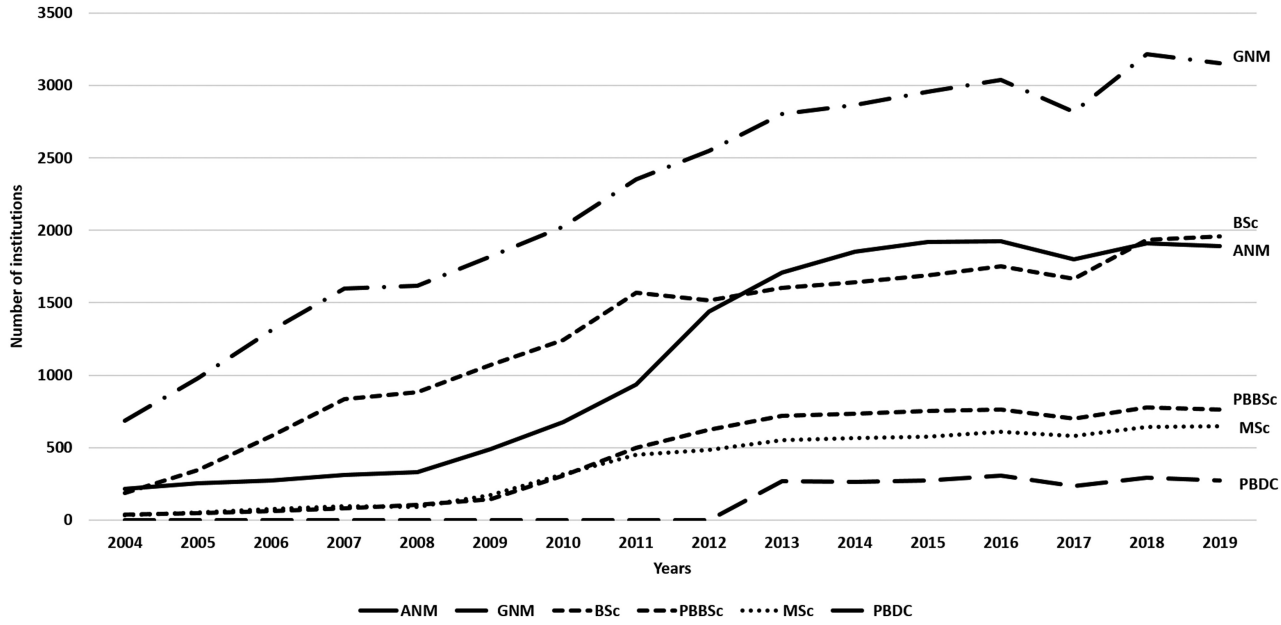

Figure 1.

The Trend of Nursing Institutions in India During 2004 and 2019.

ANM = Auxiliary Nurse and Midwife; GNM = General Nursing and Midwifery; BSc = Bachelor of Science Nursing-Basic; MSc = Masters of Science Nursing; PBBSc = Post Basic BSc Nursing; PBDC = Post Basic certificate and diploma courses.

This indicates the unavailability of adequately trained nurses in the public sector. The status may be more in the private sector. About two-thirds (67%) to of the nurses and midwives were working in the urban areas (Karan et al., 2019). The density of nurses and midwives in the urban area in India was 7.2 compared to 1.3 per 10,000 population in rural areas. The share of inappropriately qualified nurses and midwives in rural areas was 68.2% compared to 56.2% in urban areas (Rao et al., 2016).

The existing courses and training capacity of the institutes appear inadequate to meet the nursing HRH demand in the coming decade. If the demand for the growing private healthcare sector is considered, the demand expands further. From 2010 onwards the number of nurses and midwives training institutions, especially for the ANM, GNM, and BSc nursing courses has increased significantly. The nurses and midwives training institutions are unevenly distributed across the states. In 2019, the pooled nursing course seat density was <1 per 10,000 population in three states. Some states like Maharashtra, Karnataka, Kerala, Punjab, Madhya Pradesh, Tamil Nadu, and Uttar Pradesh had more institutions and seats. While most of the states had more seats for GNM/BSc nursing training, ANMs, Bihar, and Jharkhand had more ANM seats. Despite the rise in the number of institutions, it is estimated that at this pace, the existing gaps shall be met in 5–12 years period for different nurses and midwives cadres according to the education levels.

These numbers of seats don't reflect the actual availability of nurses and midwives for service in India. Under the NRHM, efforts were made to expand the HRH base with the induction of new manpower through contractual arrangements. Due to the lower salary, no continuity assurance, no promotion plan, and lack of additional benefits, after few years, several of these workers have been agitating and going on strikes seeking regularization of services (Gill, 2016). In India, the nurses and midwives workforce are also challenged by the societal class, caste system, and family level decision-making dynamics (Gill, 2016).

It is estimated that about 20% of the nursing workforce, especially those with qualifications BSc nursing and above, migrate to other countries (Hawkes et al., 2009; Thompson & Walton-Roberts, 2019). Over the last few decades, mass migration and recruitment drives for high-income countries through agencies are being organized. India stands the second source of migrated nurses to the United Kingdom after Indonesia. It is reported that about 16,000–18,000 nurses migrate annually from India (Srinivasan, 2016). Job satisfaction, salary, working conditions, professional status, career prospects, and overall living conditions are the key drivers for migration to other countries (Garner et al., 2015; Thomas, 2006).

The education and practice of nursing and midwifery are clubbed in India. The graduates are expected to play a need-based dual role of nurse and midwife. The current Indian Nursing Council Act and some state nurses Acts don't ask for regular updating of knowledge and skills through continued education or in-service training. The nurses and midwives face challenges from the trainee doctors and supervisors for practice with minimal continued practice of skills. Several of the nursing and midwifery institutions face challenges including infrastructure, availability of adequate teachers and quality teaching, and adequate supervision as per the INC's guidelines (Mayra et al., 2020). To push the infant and maternal mortality reduction agenda and achieve the targets under SDGs, there is a need to focus on nursing and midwifery training and skill sustenance. Simultaneously to support the advancements in medical services and provide

Table 2.
Nursing and Midwife Courses Seat Index[a] at State and National Level for India (2019)

State/Union Territory	ANM[a]	GNM[a]	BSc[a]	MSc[a]	PBBSc[a]	Others[a]	Pooled[a]
States							
Andhra Pradesh	0.19	1.33	1.50	0.14	0.19	0.03	3.38
Arunachal Pradesh	1.26	1.55	0.30	0.00	0.00	0.00	3.10
Assam	0.28	0.65	0.22	0.04	0.03	0.01	1.24
Bihar	0.33	0.10	0.04	0.00	0.01	0.00	0.48
Chhattisgarh	0.08	1.05	1.65	0.16	0.21	0.02	3.16
Delhi	0.14	0.30	0.29	0.05	0.04	0.09	0.92
Goa	0.47	0.24	0.85	0.12	0.05	0.19	1.91
Gujarat	0.60	0.97	0.69	0.06	0.08	0.02	2.41
Haryana	0.93	1.15	0.60	0.08	0.30	0.04	3.09
Himachal Pradesh	0.44	1.93	1.57	0.22	0.48	0.00	4.64
Jammu & Kashmir	0.36	0.50	0.62	0.06	0.09	0.00	1.63
Jharkhand	0.56	0.31	0.12	0.00	0.03	0.01	1.03
Karnataka	0.12	3.48	2.70	0.49	1.01	0.10	7.89
Kerala	0.14	1.50	2.00	0.31	0.36	0.13	4.45
Madhya Pradesh	0.36	1.87	1.01	0.13	0.26	0.01	3.64
Maharashtra	0.96	0.61	0.38	0.06	0.12	0.04	2.17
Manipur	0.75	1.91	0.97	0.06	0.07	0.00	3.76
Meghalaya	0.23	0.89	0.31	0.03	0.10	0.00	1.57
Mizoram	1.09	1.46	0.87	0.00	0.00	0.00	3.42
Nagaland	0.24	0.65	0.16	0.00	0.08	0.00	1.14
Odisha	0.90	0.69	0.35	0.06	0.07	0.01	2.09
Punjab	1.89	3.43	1.77	0.23	0.96	0.03	8.30
Rajasthan	0.10	1.07	0.95	0.06	0.15	0.01	2.33
Sikkim	0.30	0.60	2.55	0.37	0.00	0.00	3.82
Tamil Nadu	0.23	1.02	1.52	0.25	0.32	0.07	3.40
Telangana	0.13	1.03	1.19	0.12	0.12	0.05	2.63
Tripura	0.54	0.63	0.46	0.06	0.05	0.00	1.74
Uttar Pradesh	0.36	0.54	0.20	0.02	0.04	0.00	1.17
Uttarakhand	0.54	1.09	1.02	0.14	0.19	0.02	3.00
West Bengal	0.12	0.40	0.15	0.02	0.04	0.02	0.76
Union Territories							
Andaman & Nicobar Island	0.25	0.25	0.00	0.00	0.00	0.00	0.51
Chandigarh	0.10	0.00	0.59	0.10	0.20	0.07	1.06
Dadra & Nagar Haveli	0.00	0.00	1.30	0.43	0.00	0.00	1.73
Daman & Diu	0.00	0.00	1.34	0.00	0.00	0.00	1.34
Lakshadweep	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Puducherry	0.96	1.77	5.54	0.87	1.18	0.40	10.72
India	0.42	0.98	0.74	0.10	0.18	0.03	2.44

Note: [a]Index estimated per 10,000 population using nursing and midwife course seats according to Indian Nursing Council (for the year 2019–20) and population estimated for 2019 using Census 2011 and decadal growth rate.
ANM = Auxiliary Nurse and Midwife; GNM = General Nursing and Midwifery; BSc = Bachelor of Science Nursing-Basic; MSc = Masters of Science Nursing; PBBSc = Post Basic BSc Nursing; Others: Included MPhil, PhD, certificate, and diploma courses.

Table 3
The types of nursing academic courses in India

Type of course	Eligibility	Course duration	Type of examination	Registration	Work prospects
Auxiliary Nurse & Midwife (ANM)	10th grade pass	2 years	Nursing Examination Board*	RANM	HSCs and PHCs
General Nursing & Midwifery (GNM)	12th grade pass with minimum of 40% aggregate marks Age 17-35 years OR Registered ANM/LHV	3 and 1/2 years; 3 years from 2015-2016	Nursing Examination Board*	RN/RM	PHCs, CHCs, Public health hospitals
B. Sc (Basic)	12th grade pass with PCBE subjects and minimum of 45% aggregate marks	4 years	University	RN/RM	DH, MCH and SSH
B.Sc (Post Basic)	12th grade pass+ GNM pass	Regular: 2 yearsDistance: 3 years	University	Additional	DH, MCH and SSH
M. Sc.	B.Sc. Nursing/ B.Sc. Honors Nursing/ Post Basic B.Sc. Nursing with minimum of 55% aggregate marks Minimum one year of work experience after Basic B.Sc. or Post-Basic B.Sc. Nursing	2 years	University	Additional	ANMS, NS/NC, MCH and SSH
MSc Nurse practitioner courses	B.Sc. Nursing with minimum of 55% aggregate marks Minimum of one year clinical experience	2 years	University	Additional	MCH and SSH
M. Phil	M.SC. Nursing	1 year (Full time) 2 years (part time)	University	Additional	NS/NC, MCH and SSH
PhD	M.Sc./M.Phil.	3-5 years	University	Additional	NS/NC, MCH and SSH
Post Basic Specialty Diploma/Nurse Practitioner Courses	B.Sc Nursing with 1-3 years of clinical experience	1 year	Nursing Examination Board*	Additional	MCH and SSHs
Lady Health Visitor (LHV)	ANM	6 months	Nursing Examination Board*	Additional	PHCs and CHCs

Note: *Nursing Examination Board, non-university programmes
RANM and RN/RM: Registered with the State Nurses and Midwives Registration Council
Abbreviations: ANM: Auxiliary Nurse and Midwife; B.Sc: Bachelor in Science; DH: District Hospital; HSC: Health Sub-centres; LHV: Lady Health Visitor; MCH: Medical College Hospital; M.Sc: Masters in Science; NS/NC: Nursing School or Nursing College; PHC: Primary Health Centre; RANM: Registered Auxiliary Nurse & Midwife (ANM); RN/RM: Registered Nurse and Registered Midwife; SSH: Super specialty hospital.

world-class clinical services for patients from India and other developing countries, there is a need to focus on improving the quality of nursing education and creating opportunities for specialized nursing training and certification. Thus, the Indian nursing and midwifery academic sector is facing both quantity and quality challenges, which require strategic thinking and appropriate investments. Additionally, there is also a need for pushing the research agenda in nursing and midwifery and promote nurse-researchers to address the context-specific and socio-cultural appropriate issues to improve the quality of clinical care and patient satisfaction. Attention is also needed for the dedicated nursing and midwifery journals, promoting quality publications and indexing them.

Study Limitations

The study has some limitations. The data used for this study are secondary and taken from government data sources, which might suffer from completeness and validation challenges. The segregation for the public- and private sector was not available.

Conclusion and Recommendations

India suffers from a gross shortage of nurses and midwives HRH compared to the global norms with wide inter-state variations. The states with a lesser number of nursing and midwife training institutions have a severe deficit. With inadequate HRH status and sub-optimal skills, the national health policy and SDG goals cannot be achieved in the planned timeline. While the primary focus at present appears to be on the number of nurses and midwives, the efforts for improving the skills, specialized nursing services and research in nursing and midwifery must also be emphasized. Retention of qualified nurses and outmigration of nurses remain constant challenges for India.

Although there is an encouraging rise in the number of institutions and seat availability for the training of nurses and midwives over the last decade, there is a need for a further increase over the next five years to meet the global norm in a shorter timeline. In parallel to the increase in the numbers of institutions

Table 4
List of Journals with nursing and midwifery focus published from India

S. No.	Title of the Journal	Published by institute/association	Pubmed Indexed
1	Indian Journal of Continuing Nursing Education	College of Nursing, Christian Medical College, Vellore, Tamil Nadu	No
2	Journal of Pediatric Nursing	Tamil Nadu Nurses and Midwives Council, Chennai, Tamil Nadu	No
3	Journal of Medical & Surgical Nursing	Tamil Nadu Nurses and Midwives Council, Chennai, Tamil Nadu	No
4	Journal of Community Health Nursing	Tamil Nadu Nurses and Midwives Council, Chennai, Tamil Nadu	No
5	Journal of Obstetrics and Gynaecological Nursing	Tamil Nadu Nurses and Midwives Council, Chennai, Tamil Nadu	No
6	Journal of Mental Health Nursing	Tamil Nadu Nurses and Midwives Council, Chennai, Tamil Nadu	No
7	Journal of Nursing Education and Administration	Tamil Nadu Nurses and Midwives Council, Chennai, Tamil Nadu	No
8	The Journal of Nursing Trendz	MIOT College of Nursing, Chennai, Tamil Nadu	No
8	The Nurse	The Nurse, Komarapalayam, Tamil Nadu	
9	Nurses of India	Nurses of India, Bengaluru, Karnataka	No
10	Indian Journal of Psychiatric Nursing	Indian Society of Psychiatric Nurses, Bengaluru, Karnataka	No
11	Kerala Nursing Forum	The Philus College of Nursing, Kottayam, Kerala	No
12	The Journal of Nursing Research	Government College of Nursing, Thiruvananthapuram, Kerala	No
13	Journal of Nursing Research Society of India	College of Nursing, Bharati Vidyapeeth, Pune, Maharashtra	No
14	Nursing Image	Nursing Image, Mumbai, Maharashtra	No
15	Trends in Nursing Administration and Education	College of Nursing, Bhopal, Madhya Pradesh	No
16	Indian Journal of Holistic Nursing	College of Nursing, Bhopal, Madhya Pradesh	No
17	Indian Journal of Nursing Studies	Choithram College of Nursing, Indore	No
18	The Nursing Journal of India	Trained Nurses Association of India, New Delhi	No
19	Nightingale Nursing Times	Nightingale Nursing Times, NOIDA, Uttar Pradesh	No
20	International Journal of Nursing Education	Institute of Medico-Legal Publications, NOIDA, Uttar Pradesh	No
21	Nursing and Midwifery Research Journal	National Institute of Nursing Education, Chandigarh	No

and seats, there is a need to focus on the quality of training, skill retention and new competencies acquisition to support the advancements in clinical, nursing, and midwifery care. In international migration of nurses from India also must be factored in while planning the nursing training institutions and intake capacity for India and states. Additionally, there is a need to focus on creating opportunities for training and services in specialty nursing disciplines to appropriately support the advancement in clinical care.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of INCLEN Independent Ethics Committee (Date: January 20, 2020, Ref no- IIEC-022).

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – M.K.D.; Data Collection and/or Processing – M.K.D., D.S.; Analysis and/or Interpretation – M.K.D.; Writing Manuscript – M.K.D., D.S.; Critical Review – M.K.D., D.S.

Conflict of Interest: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

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Supplementary Table 1
Number of Auxiliary Nurse & Midwife (ANM) training institutions in the states during 2004 and 2019

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
States																
Andhra Pradesh	22	30	30	33	33	33	34	40	58	67	70	69	45	39	39	32
Arunachal Pradesh	0	1	1	1	1	2	2	2	2	2	2	4	5	6	7	7
Assam	9	7	6	6	6	6	7	9	16	16	17	19	24	25	34	35
Bihar	23	25	27	27	21	24	27	29	44	67	70	75	81	97	110	108
Chhattisgarh	0	0	1	1	5	6	8	31	70	88	90	93	91	79	5	5
Delhi	1	1	1	1	1	3	4	4	3	6	6	7	8	8	10	10
Goa	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
Gujarat	2	2	3	3	3	3	8	13	60	81	89	99	104	87	118	131
Haryana	9	10	10	13	23	39	40	45	55	68	75	82	89	81	87	85
Himachal Pradesh	1	2	2	4	4	4	6	6	9	10	9	8	7	5	9	10
Jammu & Kashmir	0	0	1	1	12	2	3	6	10	13	13	15	15	14	14	14
Jharkhand	0	1	3	3	1	12	14	17	27	33	38	49	58	56	67	65
Karnataka	1	4	4	4	4	6	26	38	45	45	42	43	38	28	27	26
Kerala	12	15	14	14	14	14	14	15	20	25	19	19	19	20	20	18
Madhya Pradesh	7	9	13	13	11	74	76	82	141	123	126	111	101	91	95	90
Maharashtra	16	16	22	47	48	97	180	265	390	466	554	572	561	542	552	545
Manipur	0	3	3	4	4	5	6	6	8	11	11	11	10	8	8	7
Meghalaya	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	3
Mizoram	1	2	2	2	2	2	3	3	3	3	3	3	3	3	4	4
Nagaland	0	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2
Orissa	15	16	16	16	16	22	50	67	86	105	119	131	133	131	131	129
Punjab	27	33	34	35	35	37	49	90	127	158	173	176	174	171	175	170
Rajasthan	8	8	10	10	10	11	11	11	46	43	33	29	28	29	29	27
Sikkim	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
Tamil Nadu	8	7	11	12	13	13	13	14	20	37	35	37	44	29	41	45
Telangana	0	0	0	0	0	0	0	0	0	0	0	0	18	17	17	17
Tripura	0	1	1	1	1	2	2	2	3	3	3	3	3	2	3	5
Uttar Pradesh	30	30	30	30	26	27	26	65	120	146	166	180	182	158	239	239
Uttarakhand	0	0	0	0	4	4	6	9	14	18	19	20	21	14	21	21
West Bengal	16	20	20	25	25	37	55	59	58	62	59	54	51	44	31	28

(*Continued*)

Supplementary Table 1
Number of Auxiliary Nurse & Midwife (ANM) training institutions in the states during 2004 and 2019 (Continued)

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Union Territories																
Andaman & Nicobar Islands	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Chandigarh	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Dadra & Nagar Haveli	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Daman & Diu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lakshadweep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pondicherry	0	1	1	1	1	1	1	2	1	4	5	4	6	5	7	7
Total	208	247	271	312	329	491	676	935	1442	1707	1853	1921	1927	1798	1909	1890

Note: Data source- Indian Nursing Council

Supplementary Table 2

Number of General Nursing & Midwifery (GNM) training institutions in the states during 2004 and 2019

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
States																
Andhra Pradesh	91	119	182	222	220	233	244	261	248	258	263	253	164	156	162	155
Arunachal Pradesh	0	2	2	2	2	2	2	2	2	2	3	5	5	7	7	7
Assam	12	11	11	13	13	15	16	18	24	25	26	30	32	33	52	54
Bihar	13	13	15	15	5	7	9	11	11	15	15	16	18	17	23	24
Chhattisgarh	2	2	1	2	5	10	11	26	30	41	46	58	76	72	84	81
Delhi	12	16	17	17	17	17	15	15	15	23	18	18	18	16	20	18
Goa	0	1	2	2	2	2	2	2	2	2	1	1	1	1	1	1
Gujarat	18	22	28	34	33	40	49	69	80	97	99	102	106	91	143	148
Haryana	12	19	25	30	32	38	41	45	53	64	69	78	81	71	84	81
Himachal Pradesh	5	6	6	6	5	6	25	35	33	34	34	35	38	28	41	39
Jammu & Kashmir	0	0	2	3	13	3	5	10	12	13	14	16	16	16	16	16
Jharkhand	0	0	2	2	3	13	15	19	21	22	23	24	24	24	28	29
Karnataka	154	274	392	458	467	509	520	560	545	556	531	519	515	489	487	480
Kerala	74	91	137	172	190	206	218	224	219	230	210	209	206	188	186	176
Madhya Pradesh	16	22	24	27	19	27	64	135	233	271	295	313	337	297	404	392
Maharashtra	47	58	71	99	90	97	101	106	137	177	221	254	263	254	268	264
Manipur	0	4	4	7	6	7	6	7	8	12	12	13	13	13	15	16
Meghalaya	0	5	5	8	7	7	7	7	7	7	7	7	7	7	7	8
Mizoram	3	4	4	5	5	5	5	5	5	5	5	5	5	5	6	6
Nagaland	0	1	1	1	1	1	1	1	2	2	3	4	4	5	5	5
Orissa	4	10	20	20	20	28	40	48	52	58	63	76	79	79	80	78
Punjab	55	80	92	115	117	132	147	168	182	204	215	214	212	207	218	214
Rajasthan	38	57	74	106	120	141	155	176	181	184	173	173	174	174	175	168
Sikkim	0	1	0	0	0	0	0	1	1	1	2	2	2	2	2	2
Tamil Nadu	54	66	102	122	115	145	164	189	196	212	205	210	212	199	210	204
Telangana	0	0	0	0	0	0	0	0	0	0	0	0	91	88	91	90
Tripura	1	3	3	3	3	3	3	3	5	5	5	5	5	5	5	6
Uttar Pradesh	24	34	50	62	66	80	108	146	173	197	219	228	238	197	280	276
Uttarakhand	0	0	0	2	2	2	6	10	13	18	18	19	22	16	29	32
West Bengal	22	28	38	40	40	41	46	49	54	61	63	64	67	56	75	75

(*Continued*)

Supplementary Table 2
Number of General Nursing & Midwifery (GNM) training institutions in the states during 2004 and 2019 (Continued)

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Union territories																
Andaman & Nicobar Island	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1
Chandigarh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dadra & Nagar Haveli	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0
Daman & Diu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lakshadweep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pondicherry	0	1	1	1	1	1	1	1	4	5	5	5	7	7	10	9
Total	657	951	1312	1597	1620	1820	2028	2351	2550	2803	2865	2958	3040	2820	3215	3155

Note: Data source- Indian Nursing Council

Supplementary Table 3
Number of BSc nursing training institutions in the states during 2004 and 2019

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
States																
Andhra Pradesh	39	68	107	167	180	187	211	255	220	224	230	225	144	135	149	144
Arunachal Pradesh	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
Assam	2	2	3	4	6	6	6	9	7	8	8	10	10	11	12	17
Bihar	0	0	0	0	0	0	0	0	1	3	4	4	5	5	9	10
Chhattisgarh	2	4	9	10	11	25	31	42	47	60	66	71	81	77	94	95
Delhi	5	5	5	7	7	8	8	16	10	13	11	11	11	10	11	14
Goa	0	0	2	3	3	3	3	3	3	3	3	3	3	3	3	3
Gujarat	0	3	5	8	6	11	23	34	36	43	46	52	58	49	89	98
Haryana	1	2	3	11	11	16	16	24	23	28	30	32	32	27	38	37
Himachal Pradesh	0	0	0	0	0	1	6	11	12	14	16	16	19	12	26	30
Jammu & Kashmir	0	0	0	2	0	3	3	4	4	4	5	5	8	15	14	16
Jharkhand	0	0	0	0	2	1	3	4	5	6	6	7	9	8	10	10
Karnataka	67	149	237	285	284	303	311	354	339	343	334	334	325	314	319	314
Kerala	5	12	59	83	82	88	97	119	122	129	128	126	131	124	131	132
Madhya Pradesh	7	19	23	42	48	74	85	101	116	119	124	133	147	126	190	186
Maharashtra	2	11	23	43	48	58	72	86	84	93	95	97	99	90	104	105
Manipur	0	0	0	0	0	0	1	4	4	6	6	6	6	6	7	7
Meghalaya	0	0	1	1	1	1	1	2	2	2	2	2	2	2	2	2
Mizoram	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3
Nagaland	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
Orissa	0	4	8	12	13	13	13	16	14	14	15	18	20	20	21	33
Punjab	11	14	19	30	31	60	76	92	84	92	94	101	101	100	108	108
Rajasthan	2	3	5	18	36	59	95	149	143	143	140	152	159	165	168	150
Sikkim	0	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3
Tamil Nadu	36	38	49	80	86	114	131	166	158	169	169	172	173	166	180	181
Telangana	0	0	0	0	0	0	0	0	0	0	0	0	84	83	85	84
Tripura	0	0	0	0	1	1	1	1	2	3	4	4	4	3	4	4
Uttar Pradesh	2	2	6	6	6	12	22	37	39	54	56	58	65	60	94	103
Uttarakhand	0	1	2	5	5	5	5	8	8	10	9	10	12	13	20	23
West Bengal	2	2	5	6	6	9	12	16	16	0	18	18	20	21	23	25

(*Continued*)

Supplementary Table 3
Number of BSc nursing training institutions in the states during 2004 and 2019 (Continued)

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Union territories																
Andaman & Nicobar Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Chandigarh	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2
Dadra & Nagar Haveli	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
Daman & Diu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Lakshadweep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pondicherry	0	5	5	6	6	8	8	12	12	14	14	14	15	12	15	15
Total	185	347	580	833	883	1070	1244	1570	1516	1602	1641	1690	1752	1667	1936	1958

Note: Data source- Indian Nursing Council

Supplementary Table 4

Number of Post Basic BSc nursing training institutions in the states during 2004 and 2019

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
State																
Andhra Pradesh	1	1	1	1	11	1	12	31	36	40	40	42	29	26	32	33
Arunachal Pradesh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Assam	0	0	0	0	2	1	1	3	3	4	4	4	4	4	4	4
Bihar	0	0	0	0	0	0	0	0	1	1	1	1	1	1	2	2
Chhattisgarh	0	0	0	0	2	5	8	9	13	14	14	16	17	16	19	19
Delhi	2	2	2	2	2	2	2	1	1	1	2	2	3	3	4	4
Goa	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1
Gujarat	1	1	1	1	1	1	5	8	12	17	18	18	18	10	16	20
Haryana	0	0	0	4	0	8	8	11	13	21	26	27	28	19	28	29
Himachal Pradesh	0	0	0	0	0	0	0	0	2	2	2	4	4	4	8	14
Jammu & Kashmir	0	0	0	1	0	2	3	3	3	3	3	3	4	4	4	3
Jharkhand	0	0	0	0	0	1	1	1	1	3	3	4	4	4	5	5
Karnataka	15	20	22	21	27	26	64	131	169	186	192	194	191	181	183	177
Kerala	1	2	5	6	4	8	19	34	50	54	52	52	51	47	46	41
Madhya Pradesh	3	4	4	5	6	10	29	33	47	47	50	49	55	51	72	73
Maharashtra	5	5	6	8	5	10	21	28	37	50	55	56	56	51	55	52
Manipur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Meghalaya	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Mizoram	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nagaland	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Orissa	0	0	1	2	1	2	3	2	2	2	3	5	6	6	6	10
Pondicherry																
Punjab	1	5	6	10	2	26	49	74	76	87	86	92	90	87	91	90
Rajasthan	0	0	0	1	2	14	31	50	59	59	52	52	48	47	46	42
Sikkim	0	0	0	0	0	0	0	1	1	1	2	2	2	1	0	0
Tamil Nadu	5	5	9	12	37	13	26	48	62	79	80	77	79	70	72	65
Telangana	0	0	0	0	0	0	0	0	0	0	0	0	16	16	16	16
Tripura	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
Uttar Pradesh	1	1	1	1	0	2	6	8	12	20	22	26	29	26	34	35
Uttarakhand	0	0	0	1	0	1	1	4	2	5	5	4	6	3	7	7
West Bengal	1	1	2	4	2	6	10	10	11	12	11	9	8	11	11	10

(*Continued*)

Supplementary Table 4
Number of Post Basic BSc nursing training institutions in the states during 2004 and 2019 (Continued)

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Union territories																
Andaman & Nicobar Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chandigarh	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Dadra & Nagar Haveli	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
Daman & Diu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lakshadweep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pondicherry	0	0	0	0	0	1	6	7	8	8	7	7	7	6	7	7
Total	37	49	62	82	105	142	307	500	626	721	735	752	762	700	775	765

Note: Data source- Indian Nursing Council

Supplementary Table 5
Number of MSc nursing training institutions in the states during 2004 and 2019

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
States																
Andhra Pradesh	0	2	2	2	1	19	29	54	53	58	55	55	32	29	33	36
Arunachal Pradesh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Assam	0	0	0	1	1	2	3	4	3	4	4	5	5	5	5	7
Bihar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chhattisgarh	0	0	1	1	3	4	10	12	9	12	14	16	15	14	20	21
Delhi	1	1	2	2	2	3	3	3	3	3	3	4	4	6	7	7
Goa	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1	1
Gujarat	0	0	1	1	1	1	2	4	4	4	6	9	13	11	15	20
Haryana	0	0	0	0	4	1	1	3	3	4	4	4	8	5	9	10
Himachal Pradesh	0	0	0	0	0	0	0	0	0	0	1	1	1	1	5	7
Jammu & Kashmir	0	0	0	0	0	0	0	0	2	2	2	2	2	2	3	4
Jharkhand	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1
Karnataka	15	20	25	28	22	57	120	166	174	181	181	178	176	155	157	151
Kerala	1	3	3	3	6	6	30	44	57	66	67	66	68	60	63	59
Madhya Pradesh	1	2	3	5	4	13	20	26	25	27	29	27	37	41	59	59
Maharashtra	1	2	2	5	8	10	16	22	29	33	33	35	35	34	38	40
Manipur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Meghalaya	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Mizoram	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nagaland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orissa	0	0	0	1	2	1	4	5	6	6	7	7	8	9	10	12
Punjab	0	0	2	2	10	4	13	26	26	31	36	38	40	40	35	35
Rajasthan	0	0	0	1	5	2	5	5	8	15	15	18	22	24	26	25
Sikkim	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Tamil Nadu	12	19	33	42	12	41	44	54	62	79	82	79	83	79	82	79
Telangana	0	0	0	0	0	0	0	0	0	0	0	0	25	24	24	23
Tripura	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2
Uttar Pradesh	0	0	0	0	1	0	4	6	6	7	7	9	12	12	17	17
Uttarakhand	0	0	0	0	1	1	2	3	1	3	4	4	4	4	8	8
West Bengal	0	2	2	2	4	4	4	7	6	8	9	9	9	12	12	13

(*Continued*)

Supplementary Table 5
Number of MSc nursing training institutions in the states during 2004 and 2019 (Continued)

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Union territories																
Andaman & Nicobar Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chandigarh	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Dadra & Nagar Haveli	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Daman & Diu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lakshadweep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pondicherry	0	0	0	0	0	1	4	5	5	7	7	7	7	6	7	7
Total	32	52	77	97	90	171	315	450	483	551	567	577	611	581	643	650

Note: Data source- Indian Nursing Council

Supplementary Table 6

Number of Post Basic Diploma nursing training institutions in the states during 2004 and 2019

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
States																
Andhra Pradesh	0	0	0	0	0	0	0	0	0	21	23	22	15	13	14	13
Arunachal Pradesh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Assam	0	0	0	0	0	0	0	0	0	1	2	2	3	1	2	2
Bihar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3
Chhattisgarh	0	0	0	0	0	0	0	0	0	7	8	10	10	6	6	3
Delhi	0	0	0	0	0	0	0	0	0	11	8	9	12	10	14	10
Goa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Gujarat	0	0	0	0	0	0	0	0	0	15	15	14	9	7	10	6
Haryana	0	0	0	0	0	0	0	0	0	5	5	7	7	5	8	5
Himachal Pradesh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jammu & Kashmir	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Jharkhand	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2
Karnataka	0	0	0	0	0	0	0	0	0	50	55	56	62	44	54	41
Kerala	0	0	0	0	0	0	0	0	0	35	33	33	35	33	39	28
Madhya Pradesh	0	0	0	0	0	0	0	0	0	11	10	12	11	10	10	7
Maharashtra	0	0	0	0	0	0	0	0	0	25	25	26	38	31	40	29
Manipur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Meghalaya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mizoram	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Nagaland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orissa	0	0	0	0	0	0	0	0	0	2	3	3	4	3	3	3
Punjab	0	0	0	0	0	0	0	0	0	6	9	8	9	8	8	6
Rajasthan	0	0	0	0	0	0	0	0	0	4	3	2	3	2	2	0
Sikkim	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tamil Nadu	0	0	0	0	0	0	0	0	0	42	36	38	43	25	33	25
Telangana	0	0	0	0	0	0	0	0	0	0	0	0	11	9	13	9
Tripura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uttar Pradesh	0	0	0	0	0	0	0	0	0	3	4	3	5	4	7	4
Uttarakhand	0	0	0	0	0	0	0	0	0	10	0	0	0	0	2	0
West Bengal	0	0	0	0	0	0	0	0	0	11	15	20	20	17	15	13

(*Continued*)

Supplementary Table 6

Number of Post Basic Diploma nursing training institutions in the states during 2004 and 2019 (Continued)

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Union territories																
Andaman & Nicobar Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chandigarh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Dadra & Nagar Haveli	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Daman & Diu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lakshadweep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pondicherry	0	0	0	0	0	0	0	0	0	7	7	5	7	7	7	5
Total	0	0	0	0	0	0	0	0	0	268	263	272	308	237	292	217

Note: Data source- Indian Nursing Council

Supplementary Table 7

Nursing and midwife course seat index in the states and national level according to population (per 10000 population) for the year 2019

State/ Union Territories	Population (year 2019) in millions	ANM		GNM		B.Sc		M.Sc		PBBSc		PBDC		Pooled	
		n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate
States															
Andhra Pradesh	50.776	950	0.19	6,770	1.33	7,615	1.50	726	0.14	965	0.19	160	0.03	17,186	3.38
Arunachal Pradesh	1.354	170	1.26	210	1.55	40	0.30	0	0.00	0	0.00	0	0.00	420	3.10
Assam	33.516	943	0.28	2,164	0.65	750	0.22	121	0.04	115	0.03	50	0.01	4,143	1.24
Bihar	107.293	3490	0.33	1,096	0.10	470	0.04	0	0.00	70	0.01	40	0.00	5,166	0.48
Chhattisgarh	26.782	210	0.08	2,805	1.05	4,410	1.65	424	0.16	565	0.21	60	0.02	8,474	3.16
Delhi	23.164	320	0.14	695	0.30	665	0.29	123	0.05	100	0.04	220	0.09	2,123	0.92
Goa	2.117	100	0.47	50	0.24	180	0.85	25	0.12	10	0.05	40	0.19	405	1.91
Gujarat	64.891	3880	0.60	6,265	0.97	4,464	0.69	384	0.06	520	0.08	135	0.02	15,648	2.41
Haryana	28.631	2670	0.93	3,290	1.15	1,715	0.60	217	0.08	845	0.30	110	0.04	8,847	3.09
Himachal Pradesh	7.259	320	0.44	1,400	1.93	1,140	1.57	161	0.22	345	0.48	0	0.00	3,366	4.64
Jammu & Kashmir	12.780	465	0.36	635	0.50	790	0.62	78	0.06	110	0.09	0	0.00	2,078	1.63
Jharkhand	34.887	1940	0.56	1,085	0.31	420	0.12	17	0.00	120	0.03	21	0.01	3,603	1.03
Karnataka	6,3.936	755	0.12	22,247	3.48	17,250	2.70	3,116	0.49	6,430	1.01	665	0.10	50,463	7.89
Kerala	36.241	505	0.14	5,445	1.50	7,255	2.00	1,137	0.31	1,310	0.36	467	0.13	16,119	4.45
Madhya Pradesh	81.101	2925	0.36	15,140	1.87	8,225	1.01	1,039	0.13	2,080	0.26	95	0.01	29,504	3.64
Maharashtra	124.326	11995	0.96	7,604	0.61	4,685	0.38	713	0.06	1,475	0.12	469	0.04	26,941	2.17
Manipur	2.673	200	0.75	510	1.91	260	0.97	16	0.06	20	0.07	0	0.00	1,006	3.76
Meghalaya	2.860	65	0.23	255	0.89	90	0.31	10	0.03	30	0.10	0	0.00	450	1.57
Mizoram	1.096	120	1.09	160	1.46	95	0.87	0	0.00	0	0.00	0	0.00	375	3.42
Nagaland	2.454	60	0.24	160	0.65	40	0.16	0	0.00	20	0.08	0	0.00	280	1.14
Odisha	43.450	3920	0.90	3,015	0.69	1,530	0.35	267	0.06	295	0.07	45	0.01	9,072	2.09
Punjab	29.868	5655	1.89	10,233	3.43	5,300	1.77	677	0.23	2,855	0.96	83	0.03	24,803	8.30
Rajasthan	75.828	750	0.10	8,085	1.07	7,195	0.95	460	0.06	1,105	0.15	45	0.01	17,640	2.33
Sikkim	0.667	20	0.30	40	0.60	170	2.55	25	0.37	0	0.00	0	0.00	255	3.82
Tamil Nadu	70.344	1620	0.23	7,175	1.02	10,660	1.52	1,754	0.25	2,240	0.32	475	0.07	23,924	3.40
Telangana	39.362	495	0.13	4,052	1.03	4,690	1.19	463	0.12	460	0.12	190	0.05	10,350	2.63
Tripura	3.946	215	0.54	250	0.63	180	0.46	22	0.06	20	0.05	0	0.00	687	1.74
Uttar Pradesh	228.152	8230	0.36	12,370	0.54	4,650	0.20	409	0.02	1,020	0.04	110	0.00	26,789	1.17
Uttarakhand	11.010	595	0.54	1,205	1.09	1,120	1.02	149	0.14	210	0.19	25	0.02	3,304	3.00
West Bengal	95.875	1145	0.12	3,860	0.40	1,430	0.15	220	0.02	425	0.04	205	0.02	7,285	0.76

(*Continued*)

Supplementary Table 7

Nursing and midwife course seat index in the states and national level according to population (per 10000 population) for the year 2019 (Continued)

State/ Union Territories	Population (year 2019) in millions	ANM		GNM		B.Sc		M.Sc		PBBSc		PBDC		Pooled	
		n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate
Union Territories															
Andaman.& Nicobar Island	0.785	20	0.25	20	0.25	0	0.00	0	0.00	0	0.00	0	0.00	40	0.51
Chandigarh	2.028	20	0.10	0	0.00	120	0.59	20	0.10	40	0.20	15	0.07	215	1.06
Dadra & Nagar Haveli	0.462	0	0.00	0	0.00	60	1.30	20	0.43	0	0.00	0	0.00	80	1.73
Daman & Diu	0.374	0	0.00	0	0.00	50	1.34	0	0.00	0	0.00	0	0.00	50	1.34
Lakshadweep	0.084		0.00		0.00		0.00		0.00		0.00	0	0.00	0	0.00
Puducherry	1.868	180	0.96	330	1.77	1,035	5.54	162	0.87	220	1.18	75	0.40	2,002	10.72
India	1,312.240	54728	0.42	1,28,271	0.98	97,484	0.74	12,753	0.10	23,760	0.18	3,710	0.03	3,20,706	2.44

Note: Index estimated per 10000 population using nursing and midwife course seats according to Indian Nursing Council (for the year 2019-20) and population estimated for 2019 using Census 2011 and decadal growth rate.

Abbreviation: ANM: Auxiliary Nurse and Midwife; GNM: General Nursing and Midwifery; B.Sc: Bachelor of Science Nursing-Basic; M.Sc.: Masters of Science Nursing; PBBSc: Post Basic BSc Nursing; PBDC: Post Basic certificate and diploma courses.

Supplementary Table 8

Nursing and midwife course seat index in the states and national level according to population (per 10000 population) for the year 2011

State/ Union Territories	Population (year 2011) in millions	ANM		GNM		B.Sc		M.Sc		PBBSc		PBDC		Pooled	
		n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate
States															
Andhra Pradesh	84.581	1,295	0.15	10,804	1.28	11,441	1.35	1,009	0.12	1,110	0.13	330	0.04	25,989.0	3.07
Arunachal Pradesh	1.384	40	0.29	40	0.29	0	0.00	0	0.00	0	0.00	0	0.00	80.0	0.58
Assam	31.206	384	0.12	608	0.19	300	0.10	47	0.02	95	0.03	60	0.02	1,494.0	0.48
Bihar	104.099	1,238	0.12	426	0.04	40	0.00	0	0.00	30	0.00	0	0.00	1,734.0	0.17
Chhattisgarh	25.545	2,335	0.91	1,085	0.42	2,230	0.87	166	0.06	355	0.14	70	0.03	6,241.0	2.44
Delhi	16.788	120	0.07	625	0.37	505	0.30	55	0.03	20	0.01	230	0.14	1,555.0	0.93
Goa	1.459	20	0.14	70	0.48	130	0.89	0	0.00	10	0.07	0	0.00	230.0	1.58
Gujarat	60.440	2,040	0.34	3,195	0.53	1,665	0.28	75	0.01	350	0.06	320	0.05	7,645.0	1.26
Haryana	25.351	1,850	0.73	2,140	0.84	1,045	0.41	50	0.02	390	0.15	115	0.05	5,590.0	2.21
Himachal Pradesh	6.865	185	0.27	1,250	1.82	540	0.79	0	0.00	70	0.10	0	0.00	2,045.0	2.98
Jammu & Kashmir	12.258	355	0.29	495	0.40	180	0.15	33	0.03	110	0.09	20	0.02	1,193.0	0.97
Jharkhand	32.988	695	0.21	735	0.22	230	0.07	0	0.00	30	0.01	26	0.01	1,716.0	0.52
Karnataka	61.095	1,325	0.22	25,324	4.14	17,783	2.91	3,408	0.56	6,190	1.01	640	0.10	54,670.0	8.95
Kerala	33.406	390	0.12	6,805	2.04	6,580	1.97	1,091	0.33	1,715	0.51	367	0.11	16,948.0	5.07
Madhya Pradesh	72.627	3,725	0.51	8,160	1.12	5,120	0.70	394	0.05	1,295	0.18	175	0.02	18,869.0	2.60
Maharashtra	112.374	7,733	0.69	3,799	0.34	3,750	0.33	464	0.04	1,105	0.10	364	0.03	17,215.0	1.53
Manipur	2.856	215	0.75	230	0.81	160	0.56	0	0.00	0	0.00	0	0.00	605.0	2.12
Meghalaya	2.967	45	0.15	195	0.66	90	0.30	0	0.00	30	0.10	0	0.00	360.0	1.21
Mizoram	1.097	90	0.82	130	1.18	63	0.57	0	0.00	0	0.00	0	0.00	283.0	2.58
Nagaland	1.979	20	0.10	50	0.25	0	0.00	0	0.00	20	0.10	0	0.00	90.0	0.45
Odisha	41.974	2,260	0.54	1,860	0.44	690	0.16	115	0.03	50	0.01	60	0.01	5,035.0	1.20
Punjab	27.743	4,350	1.57	8,963	3.23	4,090	1.47	416	0.15	2,430	0.88	130	0.05	20,379.0	7.35
Rajasthan	68.548	1,200	0.18	8,480	1.24	6,196	0.90	110	0.02	1,600	0.23	75	0.01	17,661.0	2.58
Sikkim	0.611	0	0.00	60	0.98	160	2.62	0	0.00	50	0.82	0	0.00	270.0	4.42
Tamil Nadu	72.147	455	0.06	5,520	0.77	8,890	1.23	1,408	0.20	2,195	0.30	788	0.11	19,256.0	2.67
Telangana	35.004		0.00		0.00		0.00		0.00		0.00		0.00	0.0	0.00
Tripura	3.674	110	0.30	210	0.57	110	0.30	0	0.00	30	0.08	0	0.00	460.0	1.25
Uttar Pradesh	199.812	3,830	0.19	7,740	0.39	1,760	0.09	105	0.01	385	0.02	65	0.00	13,885.0	0.69
Uttarakhand	10.086	365	0.36	410	0.41	360	0.36	25	0.02	70	0.07	0	0.00	1,230.0	1.22
West Bengal	91.276	2,555	0.28	2,051	0.22	705	0.08	107	0.01	425	0.05	292	0.03	6,135.0	0.67

(*Continued*)

Supplementary Table 8

Nursing and midwife course seat index in the states and national level according to population (per 10000 population) for the year 2011 (Continued)

State/ Union Territories	Population (year 2011) in millions	ANM		GNM		B.Sc		M.Sc		PBBSc		PBDC		Pooled	
		n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate
Union Territories															
Andaman.& Nicobar Island	0.381	20	0.53	20	0.53	0	0.00	0	0.00	0	0.00	0	0.00	40.0	1.05
Chandigarh	1.055	40	0.38	0	0.00	60	0.57	20	0.19	40	0.38	0	0.00	160.0	1.52
Dadra & Nagar Haveli	0.344	0	0.00	20	0.58	0	0.00	0	0.00	0	0.00	0	0.00	20.0	0.58
Daman & Diu	0.243	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.0	0.00
Lakshadweep	0.064		0.00		0.00		0.00		0.00		0.00		0.00	0.0	0.00
Puducherry	1.248	40	0.32	120	0.96	875	7.01	102	0.82	240	1.92	75	0.60	1,452.0	11.64
India	1,312.240	54728	0.42	1,28,271	0.98	97,484	0.74	12,753	0.10	23,760	0.18	3,710	0.03	3,20,706	2.44

Note: Index estimated per 10000 population using nursing and midwife course seats according to Indian Nursing Council (for the year 2011-12) and population from Census 2011