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# Role of Auxiliary Nurse Midwives in routine surveillance activities and outbreak response under the Integrated Disease Surveillance Program in Bihar, India

## Abstract

**Introduction:** India continues to experience communicable disease outbreaks caused by emerging and re-emerging pathogens. A comprehensive national strategy and outbreak response under the Integrated Disease Surveillance Program (IDSP) was adopted by the Government of India in 2004 to combat the infectious disease threats. Auxiliary nurse midwives (ANM), the main service-provider and community-mobilizer at the grass-roots, are considered to play a major role in IDSP implementation in the country. However, published literature regarding ANM's role in IDSP is limited. The current study aimed to assess ANM's role in routine surveillance activities and outbreak response under the IDSP in Bihar, which is still reporting a high burden of infectious diseases.

**Methods:** A cross-sectional study involving 241 consenting ANMs from 241 randomly selected health sub centers across the three districts of Bihar (Begusarai, Darbhanga and Bhojpur) was conducted between January and April 2019. Data regarding socio-demographic characteristics, job-related factors, IDSP related knowledge and practice during routine surveillance and outbreaks were collected through an offline-online synchronized application. In addition, information was also gathered regarding formal training, monitoring and supervision of ANM. Both descriptive and regression analyses were conducted using SAS version 9.4. The significance level was fixed at 0.05.

**Results:** The mean age of the respondents was 45 years, and were working for less than 7 years in IDSP. Majority of the participants were permanent employees, high-school educated, married, belonged to Hindu religion, resided outside their catchment area and used public transport to reach their work place. Analyses showed good practice related to capturing the potential of the cases at the sub-centre level, reporting of unusual clustering of cases to the designated medical officer and weekly submission of Syndromic form to their senior officers. Practice regarding capturing a case with two or more symptoms, maintenance of the office copy of reporting forms and record-keeping of community-based data appeared to be poor. The majority did not receive any formal training on IDSP. Almost all of them reported that monitoring, supervision and feedback from their

supervisors were inadequate and irregular. Findings also indicated insufficient supplies and logistics. The only predictor of good practice was participants' knowledge in both unadjusted and adjusted models. In addition, ANMs having relatively better IDSP-related knowledge were more likely to fill the prescribed format, S or syndromic forms correctly. It was also observed that the likelihood of filling the prescribed format syndromic or "S" forms correctly was higher in health sub-centres having better system preparedness. There was no significant association between current training program and their practices.

**Conclusion:** Findings revealed that overall practices related to routine surveillance activities and outbreak investigation process were poor among ANMs in Bihar. However, ANMs with relatively better knowledge related to IDSP showed good practices. It appeared that current training program provided by the government did not significantly improve their practices related to routine surveillance activities. Thus, improving practice through adequate training, monitoring, supervision and timely feedback could probably help in effective implementation of IDSP in Bihar, and subsequent control of communicable diseases.

**Keywords:** Auxiliary Nurse Midwives, Surveillance, Practice, IDSP, Bihar

## Introduction

Despite sincere efforts by the policymakers and public health experts, India continues to experience high burden of communicable diseases, contributing to 27.5% of all cause-mortality, especially in the younger population [1]. To address these expanding and evolving epidemics of communicable disease threats, the Government of India (GoI) has formulated several evidence-based prevention programs and policies. Among these disease control programs, the Integrated Disease Surveillance Program (IDSP) is one of the largest community-based initiatives launched by the GoI in 2004 with financial assistance from the World Bank [2]. It is a decentralized state-based surveillance program, which aimed at strengthening the infectious disease surveillance mechanism through early warning signs of impending outbreaks in the community. The IDSP has three-tier surveillance units at central, state and district levels. There are specific reporting formats under IDSP which record weekly data on epidemic-prone diseases, predominantly from public health facilities including health sub-centres, primary health centres, community-health centres, district hospitals and medical colleges in every state [2]. These formats are filled by physicians based on presumptive diagnosis (P form), confirmed cases by laboratory technicians (L form) and community-health workers [auxiliary nurse midwives (ANM)] based on reporting symptoms/syndromes (S form) [2]. Apart from routine surveillance, an outbreak investigation in each state is performed by a dedicated rapid response team (RRT). Therefore, early detection of suspected cases through syndromic approach and immediate referral to the point of care by ANMs appears crucial which can prevent or at least reduce further transmission.

Of three cadres of community-health workers in India, ANMs are the key frontline workers who are attached to sub-centres and provide basic health-care services in the community [3]. Due to acute shortage of trained health workforce and excessive pressure on public-health systems in low-and-middle-income countries, these cadres have been effectively utilized in various health programs ranging from large scale national programs to small-scale projects in the community [4]. Evidence revealed diverse role of ANMs in many areas including essential new-born care [5, 6], management of hypertensive disorders of pregnancy [7], prevention of cardiovascular diseases [8], etc. The already quoted review of literature showed promising benefits as a result of services provided by ANMs.

Given that ANMs are selected from the community they serve, it's a great opportunity to

utilize them to cater to the unique and diverse needs of the vulnerable population in the rural areas [4]. Furthermore, they can be appropriately trained for effective implementation of essential health interventions tailored to meet local needs, which are likely to improve the health outcomes [4]. However, poorly-defined job responsibilities and lack of clarity in key accountabilities often led to underutilization of ANMs' capacity, culminating into their underperformance [4, 9].

Although ANMs have been traditionally involved in maternal and child health services, their engagement in prevention and control of infectious disease outbreaks is limited [10]. Several training modules on community-case management of influenza and acute respiratory infections were released by the World Health Organization for community health workers [11, 12]. Despite these recommendations, there are gaps in the evidence with regards to the contribution of community-health workers and volunteers in epidemic preparedness. Only a few reported from African countries which included Ebola outbreak [13], Malaria control [14] and HIV care [15]. Alike in other countries, the potential role of community-health workers in infectious disease surveillance and outbreak response never received its due priority in India. ANM being the grassroots implementers of IDSP across the country, periodic assessment of their performance appears crucial to identify gaps in knowledge and skill, if any, and also to gain a deeper understanding of the ground realities. There is still a lack of research regarding role and responsibilities of ANM in IDSP. A cross-sectional survey in Haryana showed poor IDSP-related knowledge and practice among health-workers [16]. Insights on IDSP from other Indian states, particularly the economically backward states, which are still reporting a high burden of communicable diseases, are sparse.

Bihar, one of the most impoverished and densely populated Indian states [17, 18], continues to experience recurrent outbreaks of water and vector-borne diseases despite several control programs being in place, including the IDSP [19]. According to the Government report, it appeared that the risk of many vector and waterborne diseases (Dengue, Malaria, Japanese encephalitis, Leishmaniasis, Typhoid, Hepatitis, Diarrhoea, Dysentery, etc.) as well as vaccine-preventable diseases (Chicken-pox, Measles, Diphtheria, Mumps, etc.) are still high in the state [19]. Majority of these diseases are reported from rural areas, where approximately 90% of the population reside [17, 18]. Therefore, it is crucial to better understanding the role and responsibilities of ANMs in epidemic preparedness in the state as they are the first point of care for the rural people. Till date, only one study assessed the feasibility of engaging village health workers for control



of Kala-azar in Bihar [20]. Due to paucity of information, the current study was conducted to assess the surveillance activities among ANMs in Bihar so that the findings could guide policy makers in designing effective strategy for appropriate implementation of IDSP in Bihar.

## Methodology

This was a cross-sectional study conducted in three randomly selected districts (out of the total 38 districts) of Bihar between January and April 2019. Based on WHO/CDC recommended indicators, the performance of each district under the IDSP was assessed. Each district's weekly (IDSP) performance was measured by analysing the completeness and timeliness of S-reporting forms between July 2017 and June 2018 in the state.

On the basis of secondary data analysis, an infectious disease surveillance quality index (IDSQI) score was obtained, validated and measured for all the districts of the state. The districts were categorized into poor (60%), average (60% and 80%) and good (80%) on the basis of tertile distributions of IDSQI, with lowest tertile being the poor. Among the 38 districts, 14 were identified as poor, 12 as average and 12 as good performing districts. In the current study, one district was randomly selected from each performance category: Bhojpur as poor, Darbhanga as average and Begusarai as a good performing district. The sample size of 241 ANMs from 241 sub-centres (80 from each district in addition, one additional sub-centre was selected in Bhojpur) was chosen using a stratified random sampling method and block-wise proportional distributions. Assuming the poorest level of completeness of reporting unit (health sub-centre, HSC) of 40% to be improved to at least 80% as the intended impact to measure the performance change with 95% confidence interval and at 80% power with a before-after comparison of the study, the required sample of HSC to be visited became 56. Considering 30% attrition rate, the sample size was inflated to 80 per district.

Verbal informed consent was obtained prior to their (ANM on-duty in HSCs) inclusion in the study. One consenting on-duty ANM in each of the selected HSCs provided information for the study. Data were collected using an offline and online synchronized data collection application in local language (Hindi) regarding participant's socio-demographic characteristics, job-related factors, general practice regarding routine surveillance, outbreak response and record keeping. In addition, information regarding formal training on IDSP, supervision and monitoring were also gathered. ANM's

knowledge related to IDSP was also assessed on routine surveillance activities and outbreak investigation process. A composite knowledge score was calculated by adding up the scores of different knowledge subdomains (1=correct response, 0=incorrect response) and were categorized into poor, average and good based on tertile distributions, with lowest tertile being the poor. System readiness was assessed based on observations at the selected subcenters regarding infra-structure and functionality.

The primary outcome variable, practice patterns of ANMs to surveillance of infectious diseases were categorized into poor, average and good based on either tertile distributions of composite practice score (2=good, 1=average & 0=poor) or GOI recommendations for right/relatively acceptable/wrong practices. In addition, accurateness of filling in the S forms over the last 3-months was also looked into.

The data obtained were analyzed using the SAS 9.4 version (SAS.com, Cary. NC, USA). Both descriptive and inferential statistics were done. Both bivariate and multivariable logistic regression were performed to determine the predictors of better practices among participants. The measures of associations were expressed in odds ratio (OR) and 95% confidence interval (CI) in both unadjusted and adjusted models (adjusted for potential covariates). The significance level was put at 0.05.

## Result

A total of 241 consenting ANMs working in 241 health sub-centres participated in this study. The mean age was 45 years (range 43.84-46.06 years). The average length of service as ANM was about sixteen years and the mean working experience related to IDSP was little above six years among the studied population. (Table 1)

An estimated 71% were permanent employees. The majority were high-school educated (86%), married (93.36%) and Hindu by religion (98.34%). Most of the participants (83%) resided outside their catchment area and were using public transport to reach their work areas. Similar socio-demographic distributions were observed across all three sampled districts (Table 2).

The majority showed a good practice related to capturing the potential cases at the facility (sub-centre) level (97.5%) and from the community (92.5%). Nearly all respondents stated reporting of unusual clustering of cases or unusual events to the designated medical officers. About 94% participants admitted weekly submission of S forms to the next higher levels. However, record keeping of cases having two or more than two symptoms

appeared poor. The overall practice regarding the maintenance of office copy of S reporting form (79%) and community-based data (43%) was unsatisfactory, more so in Darbhanga (Table 3).

About 77% did not receive any formal training on IDSP, particularly in the Bhojpur district. Near about 50% of the respondents in Darbhanga and 58% in Bhojpur reported that their works were not monitored by their supervisors. Approximately 92% of participants did not receive any feedback from their supervisors over the last 6-months. (Table 4).

Logistic regression analyses revealed a positive association between the overall IDSP-related knowledge and practices related routine surveillance activities in both unadjusted and adjusted models. In addition, ANMs having relatively better IDSP-related knowledge and those who received formal training on IDSP were more likely to fill S forms correctly. It was also observed that the likelihood of filling S forms accurately was higher in health sub-centres with better system preparedness. (Table 5 & 6).

## Discussion

To the best of our knowledge, this was the first study that assessed the practices related to routine surveillance activities under IDSP among the representative sample of ANMs in Bihar. Overall practices related to routine surveillance activities and outbreak investigation process appeared poor among the respondents. The current training program on IDSP did not contribute much towards the adoption of recommended practices. Better IDSP related knowledge and system preparedness appeared to be positively associated with good surveillance practices among ANMs. These findings significantly contribute to evidence in support of considerable modifications needed to strengthen the existing IDSP in Bihar and subsequent control of communicable diseases.

As reported elsewhere [20, 21], majority of the participants were middle aged, married and were working under IDSP for less than 7 years. Near about 83% of the respondents lived outside their catchment areas, therefore, had to spend more time in travelling using public transport from residence to their workplaces. This finding was consistent with prior research [22]. Therefore, allotting them in the same catchment areas may be effective in improving their motivation and performance.

Analysis revealed good recommended practices with regards to capturing the potential cases of the communicable diseases at the sub-centres. Furthermore, timely reporting of unusual clustering of cases to senior medical officers was also noted. These findings were

also in congruence with the prior study [23]. Weekly submission of S reporting forms to the designated officials appeared satisfactory. However, majority of the participants expressed difficulties in record-keeping of potential cases experiencing two or more than two symptoms, which corroborated with previous studies [16, 24]. The current findings also revealed poor record-keeping at the facility levels, which were consistent with prior studies [16, 24-26].

This study also demonstrated that majority of the subcentres lacked basic infrastructures (drinking water, toilet facilities) and were ill-equipped (shortage of S forms, absence of training modules, limited number of surveillance registers) to carry out routine surveillance activities. This calls for an urgent action so that each subcentre gets equipped with basic logistics including the training manuals, display of disease-specific poster and protocols/ guidelines booklets so that ANMs are better prepared to combat the communicable disease threats at the grassroots.

Corroborating with prior findings [27-29], most of the participants felt that the training was inadequate to improve their IDSP-related knowledge and practice. This emphasized the need for adequate training for ANMs so that they became aware of syndromes to be captured under IDSP both through active and passive surveillance, routine surveillance activities, outbreak investigation process, conditions for referral and proper record keeping and documentation at the facility as indicated elsewhere [30]. As reported elsewhere [5], significant association was found between the participants' knowledge regarding IDSP and better practices. Thus, promoting some performance-based appraisal methods may help ANMs to improve further on good performance.

The current study had some limitations. Due to cross-sectional design and temporal ambiguity causal interpretation could be misleading. Given that some of the information related to outbreak response were obtained through self-reporting, chances of social desirability bias could not be completely ruled out. This study was conducted in one of the impoverished states of India, thus generalization of study results to other states should be done with caution. Despite these limitations, by virtue of robust methodology and advanced statistical analysis, the findings provided valuable insights regarding ANMs' practices related to IDSP in Bihar.

## **Conclusion**

Findings revealed that overall practices related to routine surveillance activities and

outbreak investigation process under IDSP were poor among ANMs in Bihar. However, ANM with relatively better knowledge related to IDSP showed good practice. No significant association was found between the current training program and the practices. Thus, improving practice through adequate training, monitoring, supervision and timely feedback could probably help in proper implementation of IDSP in Bihar, and subsequent control of communicable diseases.

## **Recommendations**

Based on learnings from the current study, the following recommendations are made

- Provision of formal training in local language on basic concepts related to communicable diseases endemic to Bihar, common symptoms, outbreaks and surveillance activities on a regular basis during every Tuesday meetings at primary health centres
- Provision of supportive supervision and close monitoring so that acquired knowledge is translated into best practices
- Hands-on-training on various prescribed reporting formats so that underreporting and misreporting are reduced/prevented
- Establishing accountability mechanisms so that no probable case from the community is missed
- Designing and developing e-learning courses on epidemic preparedness, outbreak response and intervention strategies using appropriate user friendly digital platform

**Table 1:** Distributions (overall and stratified) of age and job-duration of respondents (ANM) working in IDSP, Bihar, 2019

Indicators	Stratified table by District-wise											
	Overall			Begusarai			Darbhanga			Bhojpur		
	N	Mean (95% CI)		N	Mean (95% CI)		N	Mean (95% CI)		N	Mean (95% CI)	
Age (in years)	241	44.95(43.84-46.06)		80	46.40(44.42-48.38)		80	43.76(41.86-45.66)		81	44.69(42.75-46.63)	
Job duration as ANM (in months)	241	194.87 (179.46-210.28)		80	230.16 (200.76-59.57)		80	163.31 (138.63-188.00)		81	191.17 (166.34-216.00)	
Job duration in IDSP (in months)	241	74.57(69.10-80.04)		80	67.38(62.21-72.54)		80	73.10(63.06-83.14)		81	83.12(71.21-95.04)	
Total number of staff at health sub-centre	241	1.39(1.32-1.47)		80	1.70(1.56-1.84)		80	1.15(1.06-1.24)		81	1.33(1.22-1.45)	

**Table 2: Socio-demographic distributions (overall and stratified) of the respondents (ANM) working in IDSP, Bihar, 2019**

Indicator	Category	Categorical variables (Overall)			Stratified table by District					
		N	% (95% CI)	Begusarai		Darbhanga		Bhojpur		
				N	% (95%CI)	N	% (95%CI)	N	% (95%CI)	
Employment contract	Permanent	170	70.54(64.74-76.34)	64	80.00 (71.04-88.96)	52	65.00 (54.32-75.68)	54	66.67 (56.18-77.16)	
	Contractual	71	29.46(23.66-35.26)	16	20.00 (11.04-28.96)	28	35.00 (24.32-45.68)	27	33.33 (22.84-43.82)	
Education	High School	205	85.06(80.53-89.59)	68	85.00 (77.00-93.00)	67	83.75 (75.49-92.01)	70	86.42 (78.80-94.04)	
	Graduate/ Post-graduation	36	14.94(10.41-19.47)	12	15.00 (7.00-23.00)	13	16.25 (7.99-24.51)	11	13.58 (5.96-21.20)	
Marital status	Married	225	93.36(90.20-96.53)	75	93.75 (88.33-99.17)	76	95.00 (90.12-99.88)	74	91.36 (85.11-97.61)	
	Unmarried	3	1.24(0.00- 2.65)	1	1.25 (0.00-3.74)	—	—	2	2.47 (0.00-5.92)	
	Widow	13	5.39(2.52- 8.27)	4	5.00(0.12-9.88)	4	5.00 (0.12-9.88)	5	6.17 (0.82-11.53)	
Religion	Hindu	237	98.34(96.72-99.96)	80	100.0 (100.0-100.0)	78	97.50 (94.00-100.0)	79	97.53 (94.08-100.0)	
	Muslim	2	0.83(0.00- 1.98)	—	—	—	—	2	2.47 (0.00-5.92)	
	Christian	1	0.41(0.00- 1.23)	—	—	1	1.25 (0.00-3.74)	—	—	
	Other	1	0.41(0.00- 1.23)	—	—	1	1.25 (0.00-3.74)	—	—	
Living in same catchment area	Yes	42	17.43(12.60-22.25)	10	12.50 (5.09-19.91)	19	23.75 (14.22-33.28)	13	16.05 (7.88-24.22)	
	No	199	82.57(77.75-87.40)	70	87.50 (80.09-94.91)	61	76.25 (66.72-85.78)	68	83.95 (75.78-92.12)	
Mode of transport to work place	By foot	47	19.50(14.46-24.54)	13	16.25 (7.99-24.51)	20	25.00 (15.30-34.70)	14	17.28 (8.87-25.70)	
	By public transport	155	64.32(58.22-70.41)	56	70.00 (59.74-80.26)	38	47.50 (36.32-58.68)	61	75.31 (65.71-84.90)	
	By own vehicle	39	16.18(11.50-20.87)	11	13.75 (6.04-21.46)	22	27.50 (17.50-37.50)	6	7.41 (1.58-13.23)	
Field visit required	Yes	229	95.02(92.25-97.79)	80	100.0 (100.0-100.0)	68	85.00 (77.00-93.00)	81	100.0 (100.0-100.0)	
	No	12	4.98(2.21- 7.75)	—	—	12	15.00 (7.00-23.00)	—	—	

**Table 3: Practice related to job-responsibilities (overall and stratified) of respondents (ANM) working in IDSP, Bihar, 2019**

Indicator	Category	Categorical variables (Overall)		Stratified table by District					
		N	% (95% CI)	Begusarai		Darbhanga		Bhojpur	
				N	% (95%CI)	N	% (95%CI)	N	% (95%CI)
Practice: Capture potential cases of infectious diseases at subcentre	Poor	6	2.49(0.51- 4.47)	-	-	2	2.50 (0.00-6.00)	4	4.94 (0.12-9.76)
	Good	235	97.51(95.53-99.49)	80	100.0 (100.0-100.0)	78	97.50 (94.00-100.0)	77	95.06 (90.24-99.88)
Practice: Record keeping of potential cases at facility	Poor	26	10.79(6.84-14.73)	-	-	26	32.50 (22.01-42.99)	-	-
	Average	214	88.80(84.79-92.81)	79	98.75 (96.26-100.0)	54	67.50 (57.01-77.99)	81	100.0 (100.0-100.0)
Practice: submission of forms	Good	1	0.41(0.00- 1.23)	1	1.25 (0.00-3.74)	-	-	-	-
	Poor	15	6.22(3.15- 9.30)	-	-	14	17.50 (8.99-26.01)	1	1.23 (0.00-3.69)
Practice: day of submission	Average	-	-	-	-	-	-	-	-
	Good	226	93.78(90.70-96.85)	80	100.0 (100.0-100.0)	66	82.50 (73.99-91.01)	80	98.77 (96.31-100.0)
Practice: Maintenance of office copy of reporting forms	Poor	31	12.86(8.61-17.12)	8	10.00 (3.28-16.72)	19	23.75 (14.22-33.28)	4	4.94 (0.12-9.76)
	Average	1	0.41(0.00- 1.23)	-	-	1	1.25 (0.00-3.74)	-	-
Practice: Capturing cases from community	Good	209	86.72(82.41-91.04)	72	90.00 (83.28-96.72)	60	75.00 (65.30-84.70)	77	95.06 (90.24-99.88)
	Poor	190	78.84(73.64-84.03)	49	61.25 (50.34-72.16)	78	97.50 (94.00-100.0)	63	77.78 (68.53-87.03)
Practice: Ways of capturing cases from community	Good	51	21.16(15.97-26.36)	31	38.75 (27.84-49.66)	2	2.50 (0.00-6.00)	18	22.22 (12.97-31.47)
	No	18	7.47(4.13-10.81)	-	-	18	22.50 (13.15-31.85)	-	-
Practice: Capturing cases from community	Yes	223	92.53(89.19-95.87)	80	100.0 (100.0-100.0)	62	77.50 (68.15-86.85)	81	100.0 (100.0-100.0)
	Poor	92	41.26(34.74-47.77)	1	1.25 (0.00-3.74)	40	64.52 (52.27-76.77)	51	62.96 (52.22-73.71)
Practice: Ways of capturing cases from community	Average	117	52.47(45.86-59.07)	78	97.50 (94.00-100.0)	20	32.26 (20.29-44.23)	19	23.46 (14.03-32.88)
	Good	14	6.28(3.07- 9.49)	1	1.25 (0.00-3.74)	2	3.23 (0.00-7.75)	11	13.58 (5.96-21.20)



Indicator	Category	Categorical variables (Overall)			Stratified table by District					
		N	% (95% CI)	Begusarai		Darbhanga		Bhojpur		
				N	% (95%CI)	N	% (95%CI)	N	% (95%CI)	
Practice: Record keeping of community-based data	Poor	103	42.74(36.45-49.03)			38	47.50 (36.32-58.68)	65	80.25 (71.39-89.11)	
	Average	137	56.85(50.55-63.14)	79	98.75 (96.26-100.0)	42	52.50 (41.32-63.68)	16	19.75 (10.89-28.61)	
	Good	1	0.41(0.00- 1.23)	1	1.25 (0.00-3.74)	.	.	.	.	
Practice: Incorporation of community-based data	Poor	182	75.52(70.05-80.99)	46	57.50 (46.43-68.57)	72	90.00 (83.28-96.72)	64	79.01 (69.95-88.07)	
	Good	59	24.48(19.01-29.95)	34	42.50 (31.43-53.57)	8	10.00 (3.28-16.72)	17	20.99 (11.93-30.05)	
	Poor	4	1.66(0.04- 3.28)	.	.	3	3.75 (0.00-8.00)	1	1.23 (0.00-3.69)	
Practice: Verification of community-based data	Average	104	43.15(36.86-49.45)	7	8.75 (2.42-15.08)	71	88.75 (81.67-95.83)	26	32.10 (21.71-42.49)	
	Good	133	55.19(48.86-61.51)	73	91.25 (84.92-97.58)	6	7.50 (1.60-13.40)	54	66.67 (56.18-77.16)	
	Poor	30	12.45(8.25-16.65)		.	24	30.00 (19.74-40.26)	6	7.41 (1.58-13.23)	
Practice: Analysis of community-based data	Good	211	87.55(83.35-91.75)	80	100.0 (100.0-100.0)	56	70.00 (59.74-80.26)	75	92.59 (86.77-98.42)	
	Poor	42	17.43(12.60-22.25)	66	82.50 (73.99-91.01)	34	42.50 (31.43-53.57)	8	9.88 (3.24-16.51)	
	Average	129	53.53(47.18-59.87)	14	17.50 (8.99-26.01)	25	31.25 (20.87-41.63)	38	46.91 (35.81-58.02)	
Practice: capturing a case with 2 or more symptoms	Good	70	29.05(23.27-34.82)		.	21	26.25 (16.40-36.10)	35	43.21 (32.19-54.23)	
	Poor	4	1.66(0.04- 3.28)	1	.	3	3.75 (0.00-8.00)	.	.	
	Average	19	7.88(4.46-11.31)	4	5.00 (0.12-9.88)	11	13.75 (6.04-21.46)	4	4.94 (0.12-9.76)	
Practice: reporting unusual clustering of cases or unusual events	Good	218	90.46(86.72-94.19)	75	93.75 (88.33-99.17)	66	82.50 (73.99-91.01)	77	95.06 (90.24-99.88)	
	Poor	1	0.42(0.00- 1.25)	.	.	1	1.30 (0.00-3.89)	.	.	
	Good	236	99.58(98.75-100.0)	79	100.0 (100.0-100.0)	76	98.70 (96.11-100.0)	81	100.0 (100.0-100.0)	

**Table 4.** Overall IDSP-related knowledge, practice and training/supervision among respondents (ANM), Bihar, 2019

Indicator	Category	Categorical variables (Overall)			Stratified table by District					
		N	% (95% CI)	N	Begusarai		Darbhanga		Bhojpur	
					% (95%CI)	N	% (95%CI)	N	% (95%CI)	N
Overall practice	Poor	107	44.40(38.08-50.72)	5	6.25 (0.83-11.67)	66	82.50 (73.99-91.01)	36	44.44 (33.39-55.50)	
	Average	80	33.20(27.21-39.18)	39	48.75 (37.56-59.94)	13	16.25 (7.99-24.51)	28	34.57 (23.99-45.15)	
	Good	54	22.41(17.10-27.71)	36	45.00 (33.86-56.14)	1	1.25 (0.00-3.74)	17	20.99 (11.93-30.05)	
Received formal training on IDSP	No	185	76.76(71.39-82.13)	59	73.75 (63.90-83.60)	55	68.75 (58.37-79.13)	71	87.65 (80.34-94.97)	
	Yes	56	23.24(17.87-28.61)	21	26.25 (16.40-36.10)	25	31.25 (20.87-41.63)	10	12.35 (5.03-19.66)	
Monitoring of data collection by Supervisor	No	90	37.34(31.19-43.50)	5	6.25 (0.83-11.67)	38	47.50 (36.32-58.68)	47	58.02 (47.04-69.01)	
	Yes	151	62.66(56.50-68.81)	75	93.75 (88.33-99.17)	42	52.50 (41.32-63.68)	34	41.98 (30.99-52.96)	
Frequency of monitoring data collection process	Weekly	16	84.21(66.15-100.0)	8	72.73 (41.35-100.0)	7	100.0	1	100.0	
	Monthly	3	15.79(0.00-33.85)	3	27.27 (0.00-58.65)	.	.	.	.	
Received feedback from supervisor at the district-level	Yes	20	8.30(4.79-11.81)	5	6.25 (0.83-11.67)	12	15.00 (7.00-23.00)	3	3.70 (0.00-7.91)	
	No	221	91.70(88.19-95.21)	75	93.75 (88.33-99.17)	68	85.00 (77.00-93.00)	78	96.30 (92.09-100.0)	

**Table 5.** Association between overall practice related to IDSP and socio-demographic factors as well as training among respondents (ANM, n=241) in Bihar, 2019

Description	Categories	Type*	Overall Practice (Reference = Poor)					
			Average			Good		
			OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value
ANM's Age	—	UOR	1.01(0.98-1.04)	0.5950	1.03(0.99-1.07)	0.1186		
		AOR	0.99(0.96-1.04)	0.9682	1.02(0.97-1.07)	0.4714		
Education of the ANM's (Reference = High-School educated)	Graduate/ Post-graduation	UOR	0.93(0.42-2.09)	0.8682	0.79(0.31-2.04)	0.6233		
		AOR	0.81(0.33-2.03)	0.6583	0.66(0.21-2.10)	0.4776		
Overall Knowledge (Reference = Poor)	Average	UOR	3.81(1.89-7.70)	0.0002	20.93(5.68-77.09)	<.0001		
		AOR	3.83(1.88-7.81)	0.0002	20.11(5.42-74.61)	<.0001		
	Good	UOR	8.77(3.51-21.91)	<.0001	101.33(25.25-406.71)	<.0001		
		AOR	8.90(3.55-22.31)	<.0001	103.12(25.53-416.56)	<.0001		
Received formal training on IDSP (Reference = No)	Yes	UOR	1.04(0.51-2.13)	0.9085	1.78(0.85-3.73)	0.1289		
		AOR	0.99(0.48-2.07)	0.9885	1.57(0.73-3.37)	0.2501		

\*UOR=Unadjusted Odds Ratio

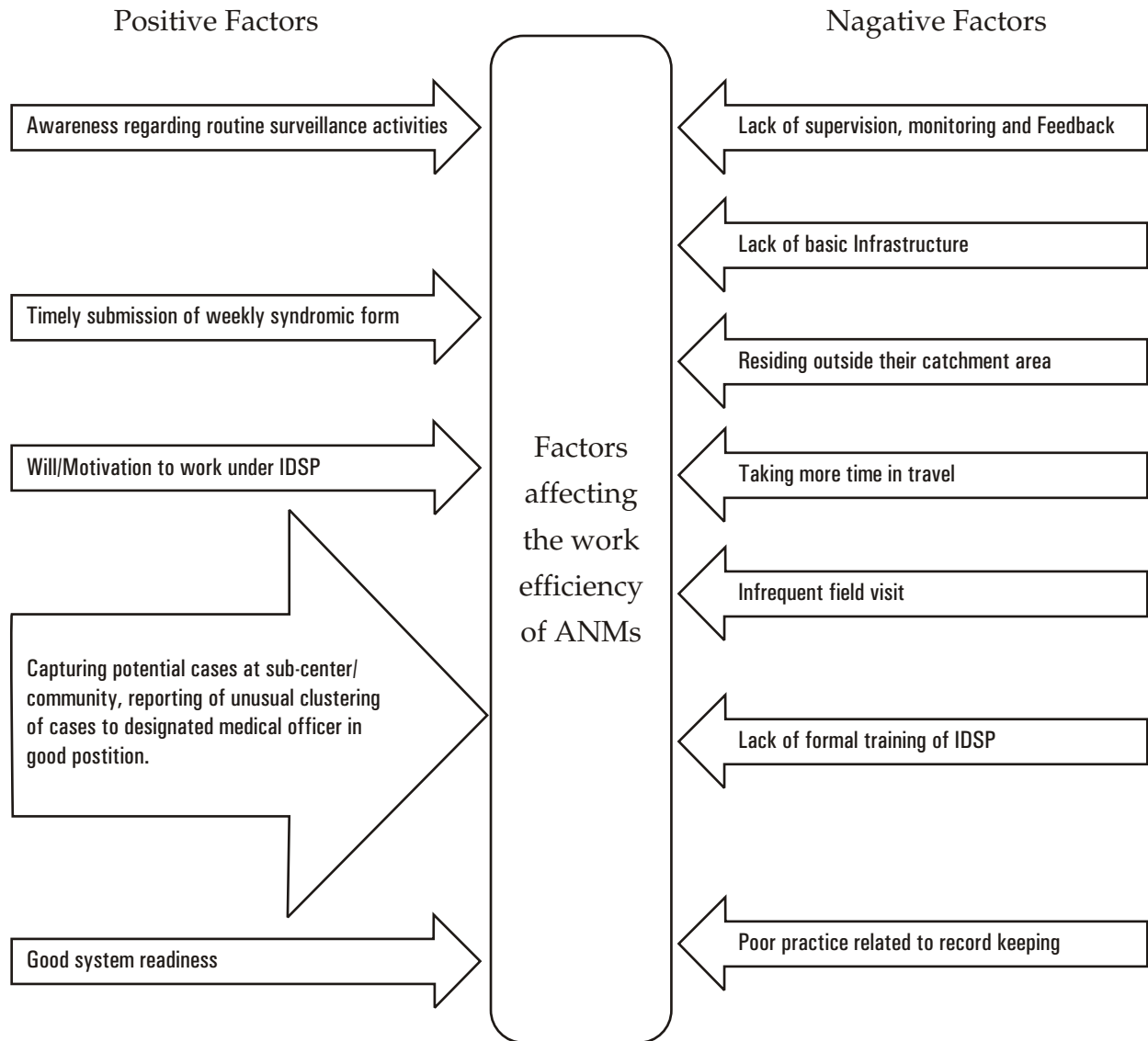
AOR=Adjusted Odds Ratio adjusted for age and education

**Table 6.** Predictors of overall practice related to IDSP-related work among respondents (ANM, n=241) in Bihar, 2019

Description	Categories	Type*	S form correctly filled or not (Reference = No)		Overall practice related to prescribed reporting format (Reference = Poor)					
			Yes		Average			Good		
			OR (95% CI)	P-Value	OR (95% CI)	P-Value	OR (95% CI)	P-Value		
Age	-	UOR	1.02(0.99-1.06)	0.2650	1.02(0.98-1.05)	0.3407	1.01(0.97-1.05)	0.7413		
		AOR	1.02(0.98-1.06)	0.4150	1.01(0.98-1.05)	0.4502	1.00(0.96-1.05)	0.8697		
Education (Reference = High-school educated)	Graduate/ Post-graduation	UOR	0.86(0.35-2.09)	0.7360	0.74(0.33-1.67)	0.4692	0.91(0.35-2.35)	0.8412		
		AOR	0.80(0.29-2.21)	0.6610	0.81(0.35-1.89)	0.6246	0.90(0.31-2.62)	0.8483		
Received formal training on IDSP (Reference = No)	Yes	UOR	1.46(0.73-2.93)	0.281	-	-	-	-		
		AOR	1.35(0.66-2.75)	0.4150	-	-	-	-		
Knowledge regarding reporting format (Reference = No)	Yes	UOR	7.87(3.98-15.65)	<.0001	1.53(0.79-2.97)	0.2088	9.04(4.13-19.77)	<.0001		
		AOR	7.94(4.00-15.74)	<.0001	1.53(0.79-2.97)	0.2113	9.04(4.13-19.78)	<.0001		
System readiness (Reference = No)	Yes	UOR	2.41(1.22-4.77)	0.0110	-	-	-	-		
		AOR	2.42(1.22-4.80)	0.0120	-	-	-	-		

\*UOR=Unadjusted Odds Ratio

AOR=Adjusted Odds Ratio adjusted for age and education



**Figure 1 :** Depicting the positive and negative factors (forces) that affect the work efficiency of ANMs in the current study

## References

1. Mohan, P., et al., *Communicable or noncommunicable diseases? Building strong primary health care systems to address double burden of disease in India*. 2019. **8**(2): p. 326.
2. John, T.J., et al., *Disease surveillance at district level: a model for developing countries*. 1998. **352**(9121): p. 58-61.
3. Scott, K., D. Javadi, and J. Gergen, *India's Auxiliary Nurse-Midwife, Anganwadi Worker, Accredited Social Health Activist, Multipurpose Worker, and Lady Health Visitor Programs: CHW Central: A global resource for and about community health workers*. 2018.
4. *Community Health Workers. What we know about them?*. World Health Organization. January 2007. [https://www.who.int/hrh/documents/community\\_health\\_workers.pdf](https://www.who.int/hrh/documents/community_health_workers.pdf).
5. Agrawal, P.K., et al., *Effect of knowledge of community health workers on essential newborn health care: a study from rural India*. 2011. **27**(2): p. 115-126.
6. Baqui, A.H., et al., *Newborn care in rural Uttar Pradesh*. 2007. **74**(3): p. 241-247.
7. Ramadurg, U., et al., *the Community Level Interventions for Pre-eclampsia (CLIP) India Feasibility Working Group*. 2016. **13**(Supplement 2): p. 113.
8. Khetan, A., et al., *Role development of community health workers for cardiovascular disease prevention in India*. 2018. **67**: p. 177-183.
9. Bhombe, I., et al., *Time-motion study of auxiliary nurse midwives of a primary health center from Wardha District of Maharashtra*. *International Journal of Advanced Medical and Health Research*, 2019. **6**(1): p. 18.
10. Boyce, M.R. and R. Katz, *Community Health Workers and Pandemic Preparedness: Current and Prospective Roles*. *Front Public Health*, 2019. **7**: p. 62.
11. Organization, W.H., *Community case management during an influenza outbreak: a training package for community health workers*. 2011.
12. Organization, W.H., *Infection-control measures for health care of patients with acute respiratory diseases in community settings: trainer's guide*. 2009, Geneva: World Health Organization.
13. Miller, N.P., et al., *Community health workers during the Ebola outbreak in Guinea, Liberia, and Sierra Leone*. *J Glob Health*, 2018. **8**(2): p. 020601.
14. Ruckstuhl, L., et al., *Malaria case management by community health workers in the Central*

- African Republic from 2009-2014: overcoming challenges of access and instability due to conflict.* Malar J, 2017. **16**(1): p. 388.
15. Topp, S.M., et al., *Motivations for entering and remaining in volunteer service: findings from a mixed-method survey among HIV caregivers in Zambia.* Hum Resour Health, 2015. **13**: p. 72.
  16. Kumar, A., et al., *Tracking the implementation to identify gaps in integrated disease surveillance program in a block of district Jhajjar (Haryana).* 2014. **3**(3): p. 213.
  17. *Bihar State Profile. Government of Bihar.* <http://gov.bih.nic.in/Profile/default.htm>.
  18. *Bihar State Report. Government of Bihar.* 2010. [https://www.nhm.gov.in/images/pdf/nrhm-in-state/state-wise-information/bihar/bihar\\_report.pdf](https://www.nhm.gov.in/images/pdf/nrhm-in-state/state-wise-information/bihar/bihar_report.pdf).
  19. *Integrated Disease Surveillance Program, State Health Society Bihar, 2020; Available at:* <http://statehealthsocietybihar.org/idsp.html>.
  20. Malaviya, P., et al., *Village health workers in Bihar, India: an untapped resource in the struggle against kala-azar.* Trop Med Int Health, 2013. **18**(2): p. 188-93.
  21. Olowookere, S.A., et al., *Knowledge, attitude, and practice of health workers in a tertiary hospital in Ile-Ife, Nigeria, towards Ebola Viral Disease.* 2015. **2015**.
  22. Sharma, B., et al., *The Role of the District Public Health Nurses: A Study from Gujarat.* 2010.
  23. Bawa, S., et al., *The knowledge, attitude and practices of the reporting of notifiable diseases among health workers in Yobe State, Nigeria.* 2003. **32**(1): p. 49-53.
  24. Mwatondo, A.J., et al., *Factors associated with adequate weekly reporting for disease surveillance data among health facilities in Nairobi County, Kenya, 2013.* 2016. **23**(1).
  25. Lehman, U., D.J.W.H.O.E. Sanders, and D.o.H.H.G. *Information for Policy, Community health workers: What do we know about them? The state of the evidence on programmes, activities, costs and impact on health outcomes of using community health workers.* 2007.
  26. Bhombe, I., et al., *Time-motion study of auxiliary nurse midwives of a primary health center from Wardha District of Maharashtra.* 2019. **6**(1): p. 18.
  27. Bawa, S. and E.J.N.P.M.J. Olumide, *The effect of training on the reporting of notifiable diseases among health workers in Yobe State, Nigeria.* 2005. **12**(1): p. 1-5.
  28. Perry, H.N., et al., *Planning an integrated disease surveillance and response system: a matrix of skills and activities.* 2007. **5**(1): p. 24.

29. Boyce, M.R. and R.J.F.i.P.H. Katz, *Community health workers and pandemic preparedness: current and prospective roles*. 2019. 7: p. 62.
30. Lyons, S., et al., *Implications of the International Health Regulations (2005) for communicable disease surveillance systems: Tunisia's experience*. 2007. 121(9): p. 690-695.









The Centre for Health Policy (CHP) at the Asian Development Research Institute (ADRI) has been set up with support from the Bill & Melinda Gates Foundation to strengthen the health sector in Bihar with a multidimensional and multi-disciplinary approach. Its aim is to engage in rigorous analysis of the health system and inform policy makers to fine-tune interventions for even stronger outcomes.

- Research and Analytical Studies

It constitutes the core of CHP's activities. The areas of research include health infrastructure and delivery with emphasis on equity, health outcomes such as IMR, MMR, TFR and its predictors, health financing, private-public partnerships, regulatory framework and its implementation, and other issues which might emerge.

- Informing Policymakers on Strengthening the Existing Health System

CHP aims to be the trusted partner of the state Government in providing evidence-based inputs in making the health system stronger, resilient and equitable.

- Sustainable Health Solutions

CHP recognizes the need for establishing a strong health system which will be self-sustaining. It means immunity to natural disasters/calamities, financial uncertainties and other unanticipated factors. These pillars may be interrelated; CHP will provide a framework of synergy among actors working on these pillars.

- Collaboration

CHP engages in collaboration with an extensive network of academic and policy research institutions both in India and abroad in health and the broader social sciences.