Assessment of knowledge and awareness regarding the Integrated Disease Surveillance Program among Auxiliary Nurse Midwives in Bihar

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Abstract

Background: Although the role of community health workers (CHWs) appeared critical for strengthening epidemic preparedness in a community, little is there in the existing literature. The current study assessed the knowledge and awareness of auxiliary nurse midwife (ANM) regarding the Integrated Disease Surveillance Program (IDSP) in Bihar, a major control program since 2009 in the state.

Methods: A cross-sectional survey was conducted among a representative sample of ANMs selected randomly from 241 health sub-centers in three districts of Bihar-Begusarai, Darbhanga and Bhojpur. Information on socio-demographic characteristics, job-related factors, general knowledge regarding surveillance, disease syndromes, reporting formats, conditions for immediate referral and outbreak investigation were collected through an offline-online synchronized data collection application. Both descriptive and inferential analyses were performed to find the distributions (overall and across the districts) of all above-mentioned factors and to determine the potential correlates of relatively better IDSP related knowledge among ANMs using SAS 9.4 version.

Results: The mean age was 45 years and on an average working less than seven years in IDSP. The majority were permanent employees, educated at least up to the 8th standard, married and belonged to the Hindu religion, resided outside their catchment area and used public transport to reach the work place. Most ANMs knew about the program and were aware of the specific reporting format for syndromic cases. Knowledge regarding the number of reporting form, specific name of the prescribed format "S-form" and reporting week were poor. Only a small proportion of the participants were aware that cases experiencing the symptoms including fever less than 7 days with bleeding, daze/semi-/unconscious, loose watery stool of less than 2 weeks with bleeding, jaundice of less than 4 weeks and unusual symptoms required urgent hospitalization. Almost all the respondents had poor knowledge regarding outbreak investigation process and the conditions that needed immediate referral. The odds of having better overall knowledge were higher among respondents with an advance in age in both unadjusted and adjusted models. Logistic regression analysis showed that the current training program did not contribute to knowledge enhancement among ANMs.

Conclusion: Overall, the knowledge and awareness regarding the current IDSP appeared poor among ANMs in Bihar. Improving knowledge through regular training by physicians and public health experts, particularly targeting young ANMs and freshers, is the need of the hour.

Keywords: ANM, Surveillance, Knowledge, Awareness, IDSP, Bihar

Introduction

Despite unprecedented global efforts, communicable diseases remain the major contributor to morbidity and mortality in middle-to-lowincome countries including India [1,2]. In India, the younger populations continue to suffer and die from communicable diseases [3]. Almost 81% of all deaths (age group 0-14 years) are due to communicable diseases in the country [2]. There are numerous disease-specific control programs at the national and state-levels (National Vector-Borne Disease Control Program, National AIDS Control Program, National Vaccine-Borne Disease Control Program, Revised National Tuberculosis Control Program, Integrated Disease Surveillance Program, etc.) for strengthening the surveillance activities so that the overall disease burden becomes less. Although disease-specific vertical programs had been partially successful in achieving short-term targets, implementation progress for the Integrated Disease Surveillance Program (IDSP) was moderate since its inception in 2004 at the national level [4]. Given such vertical programs consumed lots of resources, global experts have identified the need for integration of specific disease control programs so that information related to multiple diseases utilizing similar infrastructure and other resources are synchronized [4,5]. To enhance early warning and response to outbreaks, currently the Government of India is investing heavily on strengthening surveillance activities, laboratory support, data analysis and IT platform of the program.

An important component of IDSP has been the contribution of community health workers (CHWs). Evidence indicated that Auxiliary Nurse Midwives (ANMs) continued to play a crucial role in addressing the health needs of the community at the village levels [6,7] [8]. They serve a large population, particularly the under served or remote populations, and regarded as essential providers of basic health care services [9]. In addition, they act as community-level educators and communicating health concept to local people in a culturally appropriate way. A cross-sectional survey in Uttar Pradesh revealed that receiving counseling from CHWs significantly improved newborn practices [10]. This cadre may be better engaged in community-preparedness prior to outbreaks [11]. In view of this, adequate knowledge of communicable diseases among community health workers appears essential. Appropriate knowledge about disease surveillance among CHWs would facilitate epidemiological investigations, risk-assessment, formulation of policy tailored to local context and efficient implementation of programs at the community-level [12]. In addition to this, awareness about state-specific endemic diseases and seasonal outbreaks among them will help in the formation of priorities framework for community-preparedness using limited resources [13]. Prior studies conducted in most of the Indian states including Uttar Pradesh, Haryana, Karnataka, and Maharashtra showed that CHWs improved access to basic health-care services related to maternal health and newborn care by establishing a strong between the health care system and the local community [14-17]. However, researchers have argued

that performance of CHWs are determined by a complex interplay between three interdependent and interacting domains- means (adequate skill/knowledge), opportunity (access/availability/work) and motives (attitude/beliefs) [18]. A currently conducted case-study among Anganwadi workers or village nutrition workers in Bihar indicated poor knowledge related to nutrition despite receiving frequent trainings. Authors claimed that ability of the individual to perform a particular task required a combination of three factors namely knowledge/skills, attitudes and system support [18].

Bihar is currently experiencing dual burden of communicable and non-communicable diseases. Among several communicable disease control programs, IDSP is the major program capturing 35 diseases for the state. The major activities carried out under IDSP are weekly reporting of presumptive, laboratory and syndromic surveillance and outbreak reporting through a rapid response team. Although the progress of IDSP in Bihar has been substantial since its inception in 2009, there are still some major gaps. Even today people are affected by communicable diseases, which are largely preventable through available intervention strategies. As per the annual reports on IDSP (2009 to 2019), some of the major outbreaks related to communicable diseases in Bihar included acute diarrheal diseases, measles, dengue, Japanese encephalitis and chicken pox, which had led to severe negative socioeconomic impact [19]. The Government of Bihar felt the need to strengthen the existing program so that morbidity and mortality from avoidable causes could be reduced.

To improve the overall performance of IDSP in Bihar, a community-level health workforce having the right capacity would be critical. Currently, the program is being managed by ANMs, physicians and laboratory technicians at the grass-root levels. However, ANMs were under-utilized in the response to the infectious disease outbreaks and during routine surveillance activities and little attention had been given to their potential in contributing community-preparedness for control/prevention of communicable diseases. Given implementers required proper identification of performance barriers in a particular local context, a good quality epidemiological research would be required to identify the gaps in the existing workforce. However, such data were limited in India and almost non-existent in Bihar. Against this backdrop, the current study made an attempt to assess ANM's knowledge regarding the IDSP, syndromes captured under IDSP, outbreak investigation process, conditions for immediate referral and record keeping, and also to determine the predictors of better IDSP-specific knowledge among ANM in Bihar.

Materials and Methods

Study design   : A cross-sectional study

Study duration   : January to April 2019

Study area: Bihar is one of the poorest and under-performing states in India, contributing 8.6% of the country's population and having a low literacy rate [20]. It has 38 districts and 9 administrative units. To have a better understanding of performance of each district related to IDSP, some standard indicators were used. In the current study, the districts weekly (IDSP) performance was measured by analyzing the completeness and timeliness of S-reporting forms (a prescribed reporting format for disease-specific syndrome by ANM) for a period of 52 weeks (July 2017-June 2018) in the state. An Infectious Disease Surveillance Quality Index for Districts (IDSQID) was obtained, validated and measured for all the 38 districts of Bihar based on standard WHO/CDC/GOB recommended core IDSP indicators through analyses of secondary data. Accordingly, the districts were categorized into poor (<60%), average (≥ 60% and <80%) and good (≥ 80%) based on tertile distributions of IDSQID. Among the 38 districts of the state, 14 were identified as poor, 12 each as average and good performing. One district was randomly selected from each category. Begusarai was selected as good performing, Darbhanga as average performing and Bhojpur as poor performing districts. Following selection of the districts, all functional reporting units for PLS-form of the three selected districts were enlisted.

Sample size estimation: From all the functional health-subcenters in the three studied districts, 240 sub centers (80 from each district) were selected by stratified random sampling using a block-wise proportional distribution. Assuming the poorest level of completeness of 40% to be improved to at least 80% as the intended impact to measure the performance change with 80% power and 95% precision with a before-after comparison, 56 health sub-centers (HSCs) from each district were supposed to be included in the study. Considering the attrition rate of 30%, the sample size for HSC was inflated to 80 per district. From the list of functional HSCs in all these three districts, 240 HSCs were selected in a stratified random sampling using a block-wise proportional distribution. Additionally, 1 HSC was selected in Bhojpur.

Data collection: One consenting on-duty ANM of the selected subcenter was interviewed using an offline and online synchronized data collection application in local language. Verbal consent was obtained from each interviewee after explaining the protocol in a language they fully understood. Information collected on socio-demographic characteristics included age, education, marital status, religion, living in the catchment area, modes of transportation, job duration and field activity. In addition, data were gathered regarding their knowledge, awareness related to routine surveillance activities, syndromes captured under IDSP, reporting formats, outbreak investigation process and conditions requiring immediate referral.

Statistical analysis: Descriptive (frequency, proportion and the corresponding 95% confidence intervals (95% CIs) analyses were conducted to determine the distributions of socio-demographic, IDSP-related knowledge and awareness, knowledge about syndromes, training and supervision. Logistic Regression analysis were conducted to determine the association between socio-demographic and overall knowledge using both unadjusted and adjusted models. All descriptive and inferential quantitative analyses were done using SAS 9.4 (SAS.com, Cary.NC,USA). Overall knowledge was determined by adding up sub-domain scores (1 = correct response , 0 = incorrect response).

Results

A total of 241 health workers (ANM) from 241 health sub-centers were interviewed across the three districts-Begusarai, Darbhanga and Bhojpur. The mean age was 45 years and the majority belonged to 41-50 years age category. The average length of service as ANM was 16 years and the mean duration of work related to IDSP was little over 6 years. The distributions of age and job duration differed across districts. On an average, about 2 ANMs were working at each sub-center (Table-1A).

Overall, about 71% ANMs were permanent employees and rest were contractual. The majority completed education at least up to the 8th standard, were married and belonged to the Hindu religion. Similar distributions were observed across all districts. (Table 1B)

Approximately 83% ANMs lived outside their catchment area, more so in Begusarai. An estimated 64% availed public transport to reach their workplace and 20% reached on foot. However, in Darbhanga about 28% were using their own vehicle. On an average, in the majority, one-way commute time ranged from less than an hour to an hour in all three districts. Almost all respondents said that the field visit was a part of their routine activities (Table 1C).

Nearly, all ANMs knew about the IDSP in their block. 88% ANMs were more aware of the specific reporting format for syndrome cases at the health sub-center. More than 50% of the respondents were unaware of the specific name of the form. Knowledge regarding the number of reporting forms generated at the center was also poor, particularly in Darbhanga. Further, more than 50% of ANMs did not have any knowledge regarding the reporting week under IDSP in Darbhanga and Bhojpur. Overall knowledge regarding the syndromes captured under IDSP among ANMs appeared to be good in Begusarai, average in Darbhanga and poor in Bhojpur. Approximately 88% and 70% of respondents in Darbhanga and Bhojpur, respectively, did not have the knowledge regarding the number of syndromes captured under IDSP. Considering the individual syndromes to be captured under IDSP, it was observed that only a small proportion of participants were aware that cases experiencing the symptoms (fever less than 7 days with bleeding, daze/semi-/ unconscious, loose watery

stool of less than 2 weeks duration with bleeding, jaundice of less than 4 weeks and unusual symptoms leading to death or hospitalization) also needed to be captured. The most concerning fact was that almost all respondents did not have the correct knowledge regarding an outbreak(Tables 1D &E).

The overall knowledge regarding conditions which required immediate referral was also poor. The majority of the ANMs were also not aware that cases for example, diarrhoea with blood in stools, fever with bleeding, fever with a complete or partial loss of consciousness and convulsions required immediate referral to nearby health facilities (Tables 1F).

Overall knowledge about IDSP was poor in Darbhanga and approximately 77% of respondents did not receive proper training under the IDSP program, particularly in the Bhojpur district. Nearly 92% ANMs did not receive any feedback from their supervisor at the district level (Table 1G).

Regression analyses revealed a positive association between age and overall knowledge related to IDSP. With an advance in age, the odds of having relatively better IDSP-related knowledge increased in both unadjusted and adjusted models. No significant associations were found with education or the current formal training program on IDSP in general (Table 2).

Discussion

To the best of our knowledge, this was the first study in Bihar that assessed the level of knowledge and awareness of ANMs regarding communicable diseases under IDSP in three districts of Bihar. Findings indicated that overall knowledge regarding routine surveillance activities and outbreak investigation process as outlined under IDSP was inadequate. Although some were aware about the prescribed weekly reporting format but the majority of the participants could not articulate the conditions that required immediate referral. Except age, none of the socio-demographic factors and the current training program showed positive association with their knowledge.

The IDSP was adopted as a state strategy in Bihar since 2007 and was rolled out in all the districts since 2009. The community health workers play a significant role in the identification of epidemic-prone diseases, vulnerable population in high-risk areas and threats for potential outbreak, detection of early warning signals, thus a comprehensive knowledge about communicable diseases among health workers seemed essential for the early diagnosis and immediate referral [21]. They are also considered as a first link between the public health system and rural community due to their close contact and trustworthy relationships and provide basic health services to the population. In addition, they also play a significant role in the containment of outbreak at the local level through prompt notification to important stakeholders and decision-makers [22]. As per the published literature, it has

been established that CHWs act as a key informant in the fulfillment of the objectives of the IDSP.

The overall mean age of health workers was 45 years and the mean job duration under IDSP was less than 7 years. Most health workers were permanently employed, especially in Begusarai. Higher level of education was observed among the respondents of Bhojpur; almost all respondents were married. Results indicated that capturing of potential cases of infectious diseases was relatively better in Begusarai than the other two districts. Previously, as well as in the present study, the result indicated that almost all ANMs knew about the presence of IDSP in their block [15]. District-wise comparison showed ANM in Begusarai had better overall knowledge than Bhojpur and Darbhanga.

The current study revealed inadequate knowledge of communicable diseases among ANMs. This lack of knowledge might be attributable to infrequent/poor quality training at the grass root level, lack of monitoring and supervision and proper feedback. This was in concordance with various previous studies which reported similar scenario in public health surveillance systems [23-27]. The knowledge of communicable disease outbreak investigation process, the method of reporting, record keeping, submission of forms and day of submission were poor, which was in agreement with the prior studies [15,28-31]. Contrary to this, knowledge about reporting format among health workers was found to be higher in another previous study [32]. Knowledge regarding the name of the prescribed reporting format was also poor among ANMs in all the three districts and most of the respondents were doing mere record keeping without much understanding. Previous findings in other less-developed areas highlighted better awareness and timely reporting by community health workers was higher as opposed to the current research [33-35].

It was observed that syndromic algorithms display, training manual for ANM, syndromic surveillance register, formal register for IDSP and the communicable disease list were not in place in almost all visiting health sub-centers, which corroborated with a previous study [36]. There was a lack of basic infrastructure except in Begusarai (safe drinking water; toilet facilities; own building). The overall organization of the health center was partially satisfactory as reported elsewhere [37]. The current study findings revealed that the knowledge regarding the number of syndromes captured under IDSP was inadequate among respondents in all three districts. The majority of the respondents were unaware of important syndromes which were supposed to be captured under IDSP; for example, fever less than seven days with bleeding and daze/semi-/unconsciousness (overall), fever greater than seven days only (Darbhanga), cough with or without fever greater than two weeks (overall), loose watery stools of less than two weeks with no dehydration as well as with dehydration (Darbhanga and Bhojpur). Perhaps the most concerning fact was poor knowledge regarding the conditions requiring immediate referral among all the respondents.

Furthermore, findings revealed that the majority of the participants did not receive any formal training on IDSP. This was also observed in another study conducted in Bihar where community health workforce became unproductive due to lack of training [38]. Therefore, enhancing their knowledge regarding IDSP in general, program objectives, importance of surveillance activities, and outbreak investigation process seemed to be the need of the hour as reported elsewhere [13,36,39-41]. There were several previous studies that showed regular training of key service providers could significantly improve the overall performance of diseases surveillance systems [32,34,42].The majority of the participants told that they did not receive any timely feedback of their work. Results also indicated a clear lack of supervision and monitoring of ANM's work at the facility. In the current study, better overall knowledge was significantly associated with increasing age of community health workers. Further, good knowledge regarding reporting formats and system readiness resulted in higher likelihood of correctly filling S-forms by ANM.

The study had many limitations. The cross-sectional study design and temporal ambiguity precluded from causal inference. The study was conducted in three districts of Bihar and thus lacked generalizability. Therefore, interpretation of results outside the study area should be done with caution. Despite these limitations, by virtue of its robust methodology and rigorous statistical analyses, the current findings provided important insights into ANM's basic familiarity with the IDSP in Bihar.

Conclusion

The overall knowledge of the ANMs with regard to syndromic conditions was inadequate. Complexity of filling the syndromic form (S-form), technical inefficiency, lack of supervision and monitoring and timely feedback on reported cases as well as due to false perception that it was only a weekly reporting of just numbers together culminated into the poor knowledge of the ANMs. A multi prong integrated approach with support and collaborations from various related public health departments, government medical colleges, community-based organizations and local physicians is pertinent to enhance the sensitivity of disease surveillance at the local levels. Sustained and careful planning is required so that ANMs can understand their specific role in IDSP, increase their engagement and can mobilize community towards better epidemic preparedness.

Recommendations

Based on learnings from the current study, the following recommendations were made with regard to knowledge enhancement of ANMs in Bihar:

❑ Provision of formal on-the-job training on IDSP in general by engaging medical officers or block health managers, to whom ANMs report on a weekly basis

❏　　Provision of online training materials including short lectures, video clips at IDSP official website

❏　　Provision of essential information related to seasonal outbreaks through user-friendly mobile app

❏　　Regular supervision and monitoring by Medical-Officer-In-Charge on a weekly basis so that quality of the data quality is improved

❏　　Establishment of data-driven review mechanism and feedback linked with performance appraisal

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

Indicator			Stratified table by District					
	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 subcenter	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 1B. Socio-demographic distributions(overall and stratified) of the respondents (ANM) working in IDSP, Bihar, 2019

Indicator	Category	Categorical variables		Stratified table by District Begusarai		Darbhanga		Bhojpur	
		N	% (95% CI)	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	Beyond 8th standard	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)	–	–

Table 1C. Distributions (overall and stratified) of job-related factors of respondents (ANM) working in IDSP, Bihar, 2019

Indicator	Category	Categorical variables		Stratified table by District					
---	---	---	---	Begusarai		Darbhanga		Bhojpur	
		N	% (95% CI)	N	% (95% CI)	N	% (95% CI)	N	% (95% CI)
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 1D. Knowledge, awareness related to IDSP in general (overall and stratified) of respondents (ANM) working in IDSP, Bihar, 2019

Indicator	Category	Categorical variables		Stratified table by District					
				Begusarai		Darbhanga		Bhojpur	
		N	% (95% CI)	N	% (95% CI)	N	% (95% CI)	N	% (95% CI)
Aware of IDSP in the block	Yes	236	97.93(96.11-99.74)	80	100.0 (100.0-100.0)	75	93.75 (88.33-99.17)	81	100.0 (100.0-100.0)
	No	5	2.07(0.26- 3.89)	—	—	5	6.25 (0.83-11.67)	—	—
Knowledge regarding reporting format	Incorrect	28	11.62(7.54-15.69)	—	—	23	28.75 (18.61-38.89)	5	6.17 (0.82-11.53)
	Correct	213	88.38(84.31-92.46)	80	100.0 (100.0-100.0)	57	71.25 (61.11-81.39)	76	93.83 (88.47-99.18)
Knowledge regarding name of reporting form	Incorrect	122	50.62(44.27-56.98)	40	50.00 (38.80-61.20)	44	55.00 (43.86-66.14)	38	46.91 (35.81-58.02)
	Correct	119	49.38(43.02-55.73)	40	50.00 (38.80-61.20)	36	45.00 (33.86-56.14)	43	53.09 (41.98-64.19)
Knowledge regarding number of reporting form generated at HSC	Incorrect	136	56.43(50.13-62.74)	25	31.25 (20.87-41.63)	80	100.0 (100.0-100.0)	31	38.27 (27.46-49.09)
	Correct	105	43.57(37.26-49.87)	55	68.75 (58.37-79.13)	—	—	50	61.73 (50.91-72.54)
Knowledge regarding reporting week of IDSP	Incorrect	98	40.66(34.42-46.91)	—	—	57	71.25 (61.11-81.39)	41	50.62 (39.49-61.74)
	Correct	143	59.34(53.09-65.58)	80	100.0 (100.0-100.0)	23	28.75 (18.61-38.89)	40	49.38 (38.26-60.51)

Table 1E1. Knowledge related to specific syndromes to be captured under IDSP (overall and stratified) among respondents (ANM), Bihar, 2019

Indicator	Category	Categorical variables		Stratified table by District							
				Begusarai		Darbhanga		Bhojpur			
		N	% (95% CI)	N	% (95% CI)	N	% (95% CI)	N	% (95% CI)		
Knowledge regarding the number of syndromes captured under IDSP	Incorrect	161	66.80(60.82-72.79)	34	42.50 (31.43-53.57)	70	87.50 (80.09-94.91)	57	70.37 (60.21-80.53)		
	Correct	80	33.20(27.21-39.18)	46	57.50 (46.43-68.57)	10	12.50 (5.09-19.91)	24	29.63 (19.47-39.79)		
Knowledge regarding syndromes under IDSP: Fever less than 7 days only	Incorrect	66	27.39(21.72-33.06)			57	71.25 (61.11-81.39)	9	11.11 (4.12-18.10)		
	Correct	175	72.61(66.94-78.28)	80	100.0 (100.0-100.0)	23	28.75 (18.61-38.89)	72	88.89 (81.90-95.88)		
Knowledge regarding syndromes under IDSP: Fever less than 7 days with rash	Incorrect	104	43.15(36.86-49.45)	2	2.50 (0.00-6.00)	56	70.00 (59.74-80.26)	46	56.79 (45.77-67.81)		
	Correct	137	56.85(50.55-63.14)	78	97.50 (94.00-100.0)	24	30.00 (19.74-40.26)	35	43.21 (32.19-54.23)		
Knowledge regarding syndromes under IDSP: Fever less than 7 days with bleeding	Incorrect	216	89.63(85.75-93.50)	68	85.00 (77.00-93.00)	72	90.00 (83.28-96.72)	76	93.83 (88.47-99.18)		
	Correct	25	10.37(6.50-14.25)	12	15.00 (7.00-23.00)	8	10.00 (3.28-16.72)	5	6.17 (0.82-11.53)		
Knowledge regarding syndromes under IDSP: Fever less than 7 days with daze/semi-/un-consciousness	Incorrect	191	79.25(74.10-84.41)	42	52.50 (41.32-63.68)	74	92.50 (86.60-98.40)	75	92.59 (86.77-98.42)		
	Correct	50	20.75(15.59-25.90)	38	47.50 (36.32-58.68)	6	7.50 (1.60-13.40)	6	7.41 (1.58-13.23)		
Knowledge regarding syndromes under IDSP: Fever greater than 7 days only	Incorrect	72	29.88(24.06-35.70)	1	1.25 (0.00-3.74)	60	75.00 (65.30-84.70)	11	13.58 (5.96-21.20)		
	Correct	169	70.12(64.30-75.94)	79	98.75 (96.26-100.0)	20	25.00 (15.30-34.70)	70	86.42 (78.80-94.04)		
Knowledge regarding syndromes under IDSP: Cough with or without fever less than 2 weeks	Incorrect	85	35.27(29.19-41.35)	12	15.00 (7.00-23.00)	36	45.00 (33.86-56.14)	37	45.68 (34.60-56.76)		
	Correct	156	64.73(58.65-70.81)	68	85.00 (77.00-93.00)	44	55.00 (43.86-66.14)	44	54.32 (43.24-65.40)		
Knowledge regarding syndromes under IDSP: Cough with or without fever greater than 2 weeks	Incorrect	109	45.23(38.90-51.56)	12	15.00 (7.00-23.00)	51	63.75 (52.98-74.52)	46	56.79 (45.77-67.81)		
	Correct	132	54.77(48.44-61.10)	68	85.00 (77.00-93.00)	29	36.25 (25.48-47.02)	35	43.21 (32.19-54.23)		

Table 1E2. Knowledge related to specific syndromes to be captured under IDSP among respondents (ANM), Bihar, 2019 (Continued)

Indicator	Category	Categorical variables		Stratified table by District					
				Begusarai		Darbhanga		Bhojpur	
		N	% (95% CI)	N	% (95% CI)	N	% (95% CI)	N	% (95% CI)
Knowledge regarding syndromes under IDSP: Loose watery stools of less than 2 weeks duration with no dehydration	Incorrect	125	51.87(45.51-58.22)	3	3.75 (0.00-8.00)	64	80.00 (71.04-88.96)	58	71.60 (61.57-81.64)
	Correct	116	48.13(41.78-54.49)	77	96.25 (92.00-100.0)	16	20.00 (11.04-28.96)	23	28.40 (18.36-38.43)
Knowledge regarding syndromes under IDSP: Loose watery stools of less than 2 weeks duration with some/much dehydration	Incorrect	126	52.28(45.93-58.63)	4	5.00 (0.12-9.88)	65	81.25 (72.51-89.99)	57	70.37 (60.21-80.53)
	Correct	115	47.72(41.37-54.07)	76	95.00 (90.12-99.88)	15	18.75 (10.01-27.49)	24	29.63 (19.47-39.79)
Knowledge regarding syndromes under IDSP:Loose watery stools of less than 2 weeks duration with bleeding	Incorrect	208	86.31(81.94-90.68)	64	80.00 (71.04-88.96)	73	91.25 (84.92-97.58)	71	87.65 (80.34-94.97)
	Correct	33	13.69(9.32-18.06)	16	20.00 (11.04-28.96)	7	8.75 (2.42-15.08)	10	12.35 (5.03-19.66)
Knowledge regarding syndromes under IDSP: Jaundice cases of less than 4 weeks	Incorrect	190	78.84(73.64-84.03)	39	48.75 (37.56-59.94)	75	93.75 (88.33-99.17)	76	93.83 (88.47-99.18)
	Correct	51	21.16(15.97-26.36)	41	51.25 (40.06-62.44)	5	6.25 (0.83-11.67)	5	6.17 (0.82-11.53)
Knowledge regarding syndromes under IDSP: Acute Flaccid Paralysis cases in less than 15 years	Incorrect	124	51.45(45.10-57.81)	14	17.50 (8.99-26.01)	66	82.50 (73.99-91.01)	44	54.32 (43.24-65.40)
	Correct	117	48.55(42.19-54.90)	66	82.50 (73.99-91.01)	14	17.50 (8.99-26.01)	37	45.68 (34.60-56.76)
Knowledge regarding syndromes under IDSP: Unusual symptoms leading to death or hospitalization	Incorrect	146	60.58(54.37-66.79)	11	13.75 (6.04-21.46)	80	100.0 (100.0-100.0)	55	67.90 (57.51-78.29)
	Correct	95	39.42(33.21-45.63)	69	86.25 (78.54-93.96)	–		26	32.10 (21.71-42.49)
Overall knowledge regarding syndromes captured under IDSP	Poor	92	38.17(32.00-44.35)	1	1.25 (0.00-3.74)	58	72.50 (62.50-82.50)	33	40.74 (29.81-51.67)
	Average	74	30.71(24.84-36.57)	16	20.00 (11.04-28.96)	22	27.50 (17.50-37.50)	36	44.44 (33.39-55.50)
	Good	75	31.12(25.23-37.01)	63	78.75 (69.59-87.91)	–		12	14.81 (6.91-22.72)

Table 1F. Knowledge and practice related to capture of probable cases and referral conditions among respondents (ANM), Bihar, 2019

Indicator	Category	Categorical variables		Stratified table by District					
				Begusarai		Darbhanga		Bhojpur	
		N	% (95% CI)	N	% (95% CI)	N	% (95% CI)	N	% (95% CI)
Practice: capturing a case with 2 or more symptoms	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)
	Good	70	29.05(23.27-34.82)	–	–	21	26.25 (16.40-36.10)	35	43.21 (32.19-54.23)
Knowledge regarding an outbreak	Incorrect	240	99.59(98.77-100.0)	79	98.75 (96.26-100.0)	80	100.0 (100.0-100.0)	81	100.0 (100.0-100.0)
	Correct	1	0.41(0.00- 1.23)	1	1.25 (0.00-3.74)	–	–	–	–
Practice: reporting unusual clustering of cases or unusual events	Poor	4	1.66(0.04- 3.28)	1	1.25 (0.00-3.74)	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)
	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)
Person to whom ANM reports unusual clustering of cases or unusual events	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)
Condition requiring immediate referral: Diarrhea with dehydration	Incorrect	44	18.26(13.35-23.17)	1	1.25 (0.00-3.74)	36	45.00 (33.86-56.14)	7	8.64 (2.39-14.89)
	Correct	197	81.74(76.83-86.65)	79	98.75 (96.26-100.0)	44	55.00 (43.86-66.14)	74	91.36 (85.11-97.61)
Condition requiring immediate referral: Diarrhea with blood in stools	Incorrect	206	85.48(81.00-89.96)	58	72.50 (62.50-82.50)	71	88.75 (81.67-95.83)	77	95.06 (90.24-99.88)
	Correct	35	14.52(10.04-19.00)	22	27.50 (17.50-37.50)	9	11.25 (4.17-18.33)	4	4.94 (0.12-9.76)

Stratified table by District

Indicator	Category	Categorical variables		Begusarai		Darbhanga		Bhojpur	
		N	% (95% CI)	N	% (95% CI)	N	% (95% CI)	N	% (95% CI)
Condition requiring immediate referral: Fever with bleeding	Incorrect	215	89.21(85.27-93.16)	67	83.75 (75.49-92.01)	72	90.00 (83.28-96.72)	76	93.83 (88.47-99.18)
	Correct	26	10.79(6.84-14.73)	13	16.25 (7.99-24.51)	8	10.00 (3.28-16.72)	5	6.17 (0.82-11.53)
Condition requiring immediate referral: Fever with partial or complete loss of consciousness	Incorrect	145	60.17(53.94-66.39)	39	48.75 (37.56-59.94)	54	67.50 (57.01-77.99)	52	64.20 (53.53-74.86)
	Correct	96	39.83(33.61-46.06)	41	51.25 (40.06-62.44)	26	32.50 (22.01-42.99)	29	35.80 (25.14-46.47)
Condition requiring immediate referral: Convulsions	Incorrect	166	68.88(62.99-74.77)	34	42.50 (31.43-53.57)	68	85.00 (77.00-93.00)	64	79.01 (69.95-88.07)
	Correct	75	31.12(25.23-37.01)	46	57.50 (46.43-68.57)	12	15.00 (7.00-23.00)	17	20.99 (11.93-30.05)
Condition requiring immediate referral: Unusual diseases/cases	Incorrect	78	32.37(26.42-38.31)	5	6.25 (0.83-11.67)	66	82.50 (73.99-91.01)	7	8.64 (2.39-14.89)
	Correct	163	67.63(61.69-73.58)	75	93.75 (88.33-99.17)	14	17.50 (8.99-26.01)	74	91.36 (85.11-97.61)
Overall knowledge regarding conditions for referral	Poor	128	53.11(46.77-59.46)	15	18.75(10.01-27.49)	68	85.00 (77.00-93.00)	45	55.56 (44.50-66.61)
	Average	54	22.41(17.10-27.71)	23	28.75(18.61-38.89)	7	8.75 (2.42-15.08)	24	29.63 (19.47-39.79)
	Good	59	24.48(19.01-29.95)	42	52.50(41.32-63.68)	5	6.25 (0.83-11.67)	12	14.81 (6.91-22.72)

Table 1G. Overall IDSP-related knowledge, practice and training/supervision among respondents (ANM), Bihar, 2019

Domain	Indicator	Category	Categorical variables		Stratified table by District					
					Begusarai		Darbhanga		Bhojpur	
			N	% (95% CI)	N	% (95% CI)	N	% (95% CI)	N	% (95% CI)
OVERALL		Poor	105	43.57(37.26-49.87)	5	6.25 (0.83-11.67)	69	86.25 (78.54-93.96)	31	38.27 (27.46-49.09)
KNOWLEDGE		Average	72	29.88(24.06-35.70)	24	30.00 (19.74-40.26)	11	13.75 (6.04-21.46)	37	45.68 (34.60-56.76)
		Good	64	26.56(20.94-32.17)	51	63.75 (52.98-74.52)	–	–	13	16.05 (7.88-24.22)
	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)
TRAINING & SUPERVISION	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 2. Association between overall knowledge related to IDSP and socio-demographic factors as well as training among respondents (ANM, n = 241) in Bihar, 2019

Description	Categories	Type*	Overall Knowledge (Reference=Poor)				
			Average		Good		
			OR (95% CI)	P-Value	OR (95% CI)	P-Value	
Age	–	UOR	1.04(1.01-1.08)	0.0181	1.02(0.98-1.05)	0.3305	
		AOR	1.05(1.01-1.10)	0.0078	1.02(0.98-1.06)	0.2737	
Education (Reference=Beyond 8th standard)	Graduate/	UOR	0.97(0.41-2.29)	0.9406	1.25(0.53-2.91)	0.6125	
	Post-graduation	AOR	1.31(0.52-3.27)	0.5631	1.47(0.60-3.58)	0.4026	
Received formal training on IDSP	Yes	UOR	0.77(0.37-1.61)	1.6130	1.16(0.57-2.36)	2.3630	
(Reference=No)		AOR	0.61(0.28-1.30)	0.1997	1.06(0.50-2.23)	0.8813	

**UOR = Unadjusted Odds Ratio
AOR = Adjusted Odds Ratio, adjusted for age and education

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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.