Physicians' knowledge and awareness regarding the Integrated Disease Surveillance Program (IDSP) in Bihar

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January, 2021

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Physicians' knowledge and awareness regarding the Integrated Disease Surveillance Program (IDSP) and Response in Bihar

Abstract

Objective: Physicians' knowledge about the infectious disease surveillance and outbreak investigation appeared essential for early diagnosis, case-specific management and timely reporting of reportable diseases to the health authority. Given paucity of information, this study aimed to assess the physicians' knowledge and awareness regarding the Integrated Disease Surveillance Program (IDSP), a major infectious disease control program, in Bihar.

Methods: This was a cross-sectional study conducted among 253 consenting physicians who were attached with the public health sector in three districts of Bihar: Begusarai, Darbhanga and Bhojpur between January and April 2019. A mobile data collection application (offline and online synchronized) was used to collect information regarding general characteristics, job-related factors and IDSP-related knowledge in terms of program objectives, surveillance, case definition of reportable diseases under IDSP, case detection, disease names, trigger levels, outbreak detection, reporting formats and database management. Both descriptive and logistics regression analyses were performed using SAS software version 9.4.

Findings: Of the total 253 participating physicians, almost all belonged to Bihar, about 64% were MBBS holders and 45% were permanent employees. IDSP-related knowledge in general, outbreak investigation and specific reporting format appeared inadequate among the respondents. Approximately 52% were not aware of IDSP objectives, 34% could not mention the reportable diseases under IDSP and 87% did not have the correct knowledge regarding the reporting format. Similar insufficiencies in knowledge regarding standard case definitions, case registration, outbreak detection and outbreak management were observed among the participants. Overall, about 25% respondents had good knowledge regarding outbreak preparedness and response. Significant positive associations were found with better overall knowledge about the IDSP and professional medical (MBBS) degree [(AOR(average) 2.20 (95% CI=1.14- 4.27), AOR(good) 4.96 (95% CI=2.14-11.47)] and receiving formal training on IDSP [AOR:3.25, 95% CI=1.39-7.65].

Conclusion: A relatively high percentage of physicians in Bihar had insufficient

knowledge of surveillance and reporting format of notifiable communicable diseases under IDSP. Regular training of physicians regarding surveillance in general, case definition and disease notification appeared crucial, particularly among the non-MBBS degree holders.

Keywords

Physicians, knowledge and awareness, IDSP, Bihar

Introduction

India located in South-East Asia with 1.38 billion people is the second most populous country in the world. [1] Alike many developing countries, the overburdened health system of India faced the triple threat of traditional infectious diseases, remerging infectious diseases and chronic life-style diseases. [2-3] Research published so far indicated that the prevalence of communicable diseases was significantly higher in rural areas than in urban counterparts. [4] As per the global estimates, the South-East Asian Region, including India, is still experiencing high burden of several infectious diseases like Dengue, Japanese Encephalitis, Acute Encephalitis Syndrome, Chikungunya, Malaria, Acute Diarrheal Diseases, Tuberculosis, Leptospirosis etc. In addition, approximately one-quarter of the world's soil-transmitted helminth infections, one-third or more of the global deaths from Rabies, half of the estimated global burden of Lymphatic Filariasis, Leprosy and Visceral Leishmaniasis are reported from this region. [5-12] Although India has made impressive progress over the years in controlling Poliomyelitis, Tuberculosis, Neonatal Tetanus, several outbreaks of other infectious diseases culminated into negative socio-economic consequences. Furthermore, due to rapid changes in environment and socio demographic transition, there has been an emergence and re-emergence of pathogens, mostly of viral origin, which have threatened the country in the recent past. These included H1N1 influenza, Avian influenza, Diphtheria, Vibrio cholera 0139, Crimean-Congo hemorrhagic fever, Chikungunya fever, Rota virus, Nipah virus and Chandipura virus. [13-14] Yet, despite earlier efforts to address the negative health impact, such approaches appeared less useful to mitigate the impact of infectious diseases.

Epidemic response for prevention and control of infectious diseases within limited infra-structure and resources required information related to potential risk factors, their distributions, disease trend and rapidly evolving profile of micro-organisms. Therefore, a well-coordinated, robust and resilient surveillance system engaging physicians, laboratories and public health system appeared critical for early detection, timely treatment and interruption of onwards transmission as reported elsewhere. [15] However, research suggested that health care providers in general had limited knowledge about disease surveillance, their specific role in reporting and infectious disease emergency response plan. [16-17] Given clear risks from infectious diseases, evidence suggests early detection via integrated surveillance mechanism, reporting and timely intervention, the burden of infectious diseases could be reduced to a large extent. [18] Therefore, prompt

notification and reporting of clinically suspected cases by the treating physicians to the designated authority appears critical for timely intervention, an essential step for control of infectious disease. [19]

Based on learnings from other developing countries and as a major step towards disease control objectives, India too established a decentralized state-based surveillance system, the Integrated Disease Surveillance Program (IDSP), to monitor infectious disease trends and to detect outbreaks at the grass-roots. [20] The primary objective of the IDSP was to detect early warning signals of epidemic-prone diseases so that appropriate intervention could be implemented on time. The key functionaries related to IDSP included community health worker (auxiliary nurse midwife, ANM), physicians and laboratory technicians. Information related to infectious diseases are gathered at district level from all public health centers which included health sub-centers, primary or additional health centers, community health care centers, referral hospitals and district hospital. [20] Weekly data captured in IDSP portal included syndromic surveillance, presumptive and laboratory diagnosis on a weekly basis and physicians form the mainstay of disease reporting and outbreak detection. [20]

The existing disease surveillance and notification system in India for infectious disease outbreak prevention and control, especially at the ground level, render the clinicians indispensable because they are the ones who detect disease through clinical diagnosis and also supervise the other two core components of the IDSP, which includes syndromic management and laboratory surveillance. The roles of clinicians in ensuring a functional disease surveillance are diverse ranging from presumptive surveillance approach, laboratory report recommendation, case-specific clinical management, supportive supervision of ANM work to outbreak investigation. They form the backbone of Rapid Response Teams (RRT) under the IDSP that undertake outbreak investigations and response. [21,22]

Despite the fact that several control programs have been implemented at large scale, the communicable diseases attribute to major outbreaks resulting into high morbidity in the state of Bihar. The IDSP, which was introduced by the Government of India in 2004, was adopted and implemented in Bihar since 2009 to minimize the above-mentioned fallouts of outbreaks and epidemics. [23] Evidence emerged that the failure of the syndromic surveillance was partly attributable to the ignorance and poor knowledge of disease reporting and notification among physicians and health workers. [17,24]

The IDSP was implemented in all districts of Bihar for almost a decade but till date no assessment of physicians' knowledge and awareness regarding IDSP had been carried out. Given scarcity of information and an identified need for programmatic improvements, this study was conducted to assess the IDSP related knowledge and awareness among physicians working in the public health sector of Bihar so that the learnings could help to narrow the achievement gaps in the program.

Methods

Study setting

The study was conducted in the state of Bihar, situated in the eastern region of India. It shared an international border with Nepal in the north and by the states of West Bengal, Uttar Pradesh and Jharkhand in the east, west and south.

Study design

A mixed method approach was used

Time frame

The study was conducted between January and April 2019

Sampling method and selection of participants

Of the total 38 districts in the state, three were chosen based on their relative performance in weekly reporting for IDSP as assessed from the available secondary data for the past one year (between 2016 and 2017). Subsequently, an Infectious Diseases Surveillance Quality Index (IDSQI) score was obtained from the data and districts were divided into categories of good (12 districts), average (12 districts) and poor performing (14 districts). One district each was randomly chosen from the three identified categories to be included in the study. Bhojpur was selected from the poor performing districts, Darbhanga was selected from the average performing districts and finally, Begusarai was selected among the good performing districts.

From all the 92 reporting units (health facilities) in 46 blocks in three selected districts of Begusarai (Good performing), Darbhanga (Average performing), Bhojpur (Poor performing), a total 253 (Begusarai=63, Darbhanga=90, Bhojpur=100) physicians in designated health facilities who gave consent were interviewed.

Data collection and analysis

Interviewer conducted in-person interview with the help of a mobile device with online-offline database synchronization. Information gathered regarding the physicians' knowledge about the surveillance system for infectious diseases, case definition, case reporting, trigger level of any impending infectious disease outbreak, and database management (entry/cleaning/management), analysis and dissemination in the IDSP. The overall knowledge score of each sub-domain (correct response=1, incorrect response=0) was categorized into good, average and poor based on its tertile distributions, the lowest tertile represented the poor knowledge.

Data analysis was done with SAS software version 9.4. All the numerical (continuous) variables were summarized for mean and 95% confidence interval (CI). Categorical variables were tabulated for frequency distribution and 95% CI each category. Bivariate analyses were performed to investigate associations between dependent variables (physicians' knowledge regarding IDSP) and the following independent variables: doctors' age, type of medical training(degree), and IDSP-related training. Multi variable logistic regression was performed on the key outcome variables of knowledge regarding IDSP. The following independent variables were included in all models: doctor's age and type of medical training (degree).

Findings

Of total 253 physicians interviewed, the mean age was 45.77 (95%CI 44.38-47.16) years and had 5 years (60.81 months (95%CI 51.03-70.58)) on average experience working for IDSP. Of the 253 clinicians, 161(63.64% (95%CI (57.67-69.60)) had MBBS degree and 73 (28.85(23.23-34.47)) had AYUSH degree. Data revealed about 80% (95%CI 72.02-87.98) of the doctors in Bhojpur had a MBBS degree. Almost all of the respondents were from Bihar (251, 99.21% (95%CI 98.11-100.0)) and mostly were contractual staff (54.94 % (95%CI 48.77-61.11)), especially in Begusarai with a 71.43% (59.96-82.90) contractual workforce. Most were placed in the Primary Health Centers (N=156, 61.66% (95%CI 55.63-67.69)). It took on average 18.32 (95%CI 16.69-19.95) minutes for the physicians to reach their work place and most of them used personal transport (158, 62.45% (95%CI 56.44-68.46)). (Table 1)

Knowledge regarding disease surveillance was poor (86.17% (95%CI 81.88-90.45)) though majority of the respondents had heard about the IDSP (86.17(81.88-90.45)). In Begusarai, majority of the doctors knew about the objectives of IDSP (90.48 (83.02-97.93)), the scenario was completely opposite in Darbhanga (36.07 (23.67-48.47)) and Bhojpur (27.66 (18.45-36.87)). In contrast to the other two districts, 60.66% (95%CI 48.04-73.27) of the clinicians in Darbhanga failed to identify the most crucial level where almost all of the IDSP activities take place. Only in Bhojpur, 59% of the participants (59.00% (95%CI 49.19-68.81) were aware of the approaches recommended to capture probable cases reporting to the facility. (Table 2)

Most of the clinicians in Darbhanga had poor knowledge (91.11 (85.12-97.10)) about the communicable diseases reported under IDSP. Knowledge about bacillary dysentery (39.00 (29.27-48.73)), fever of unknown origin (28.00 (19.05-36.95)) and acute respiratory infection (33.00 (23.62-42.38)) appeared poor among physicians in Bhojpur. Similarly, knowledge about leptospirosis was lacking (72.73 (67.20-78.25)) among most of the physicians across all three districts. (Table 3)

Compared to the other two districts, overall knowledge of standard case definitions was lacking in Darbhanga, only 6.67% (1.41-11.92) showed good knowledge. Majority of the physicians had incorrect knowledge regarding standard case definition of acute encephalitis syndrome in Begusarai (58.73% (95%CI 46.23-71.23)) and acute diarrheal diseases in Darbhanga (80.00 (71.58-88.42)). In addition, knowledge regarding standard case definition of enteric fever or typhoid was also inadequate among the physicians of Darbhanga (46.67 (36.16-57.17)) and Bhojpur (41.00 (31.19-50.81)). (Table 4)

Overall knowledge regarding trigger levels for epidemic-prone diseases was quite low in the districts of Darbhanga (3.33 (0.00-7.11)) and Bhojpur (25.00 (16.36-33.64)). In general, participants showed inadequate knowledge regarding the trigger levels for epidemic prone diseases particularly for diseases including acute diarrheal disease (27.27(21.75-32.80)), viral hepatitis (23.72(18.44-28.99)) and enteric fever or typhoid (10.67(6.84-14.50)). (Table 5)

Knowledge regarding the prescribed reporting format of IDSP was surprisingly low among the participants in all the three districts (12.65(8.52-16.77)). The majority did not know about the number of reporting forms generated (73.91(68.47-79.36)) and were unable to name the specific reporting formats (86.56(82.33-90.79)). In Darbhanga and Bhojpur, most physicians had no knowledge regarding data collection (Darbhanga= 87.78% (95%CI 80.88-94.68), Bhojpur= 76.00 (67.48-84.52)), collation (Darbhanga= 64.44 (54.36-74.53), Bhojpur= 71.00 (61.95-80.05)), storage (Darbhanga= 90.00 (83.68-96.32), Bhojpur= 78.00 (69.74-86.26)). (Table 6)

The majority of the respondents identified a usual response time of less than 24 hours to an outbreak occurrence (94.07(91.14-97.00)) to be ideal. The respondents generally mentioned clustering of cases from the same locality on a given day or consecutive days (42.29(36.16-48.42)) followed by information from the affected community (29.25(23.61-34.89)) as means of outbreak detection. Most of the physicians in Darbhanga and Bhojpur informed that usually the Pharmacist/Block Health Manager informed the district surveillance office over phone about an outbreak (Darbhanga= 63.33 (53.18-73.48); Bhojpur= 91.00 (85.29-96.71)). (Table 7)

Of total 253 participants, only 106 (41.90% (95%CI 35.78-48.02)) explored risk factors during an outbreak. Overall knowledge regarding exploring potential risk factors was poor among 81.11% (95%CI 72.87-89.36) medical officers in Darbhanga. Overall knowledge regarding outbreak preparedness and response also appeared inadequate among the respondents in Darbhanga (86.67% (95%CI 79.51-93.83)). (Table 8)

Regression analysis revealed that the odds of having better overall knowledge about the IDSP was higher among the MBBS degree holders when compared to AYUSH practitioners (AOR Average 2.20(95%CI 1.14- 4.27) and AOR Good 4.96(2.14-11.47); reference=poor knowledge). Knowledge and awareness were also found to be more among those physicians who received formal training on IDSP (AOR 3.25(1.39- 7.65), reference=poor knowledge). (Table 9)

Table 1: General information of the responding physicians in the three studied districts of Bihar, 2019 (N=253)

Description		Overall		Begusarai		Darbhanga		Bhojpur	
		N	Mean (95% CI)	N	Mean (95% CI)	N	Mean (95% CI)	N	Mean (95% CI)
Job duration as Physician in IDSP (in months)		253	60.81(51.03-70.58)	63	56.08(48.92-63.24)	90	53.29(40.25-66.33)	100	70.55(49.08-92.02)
Age of the respondent		253	45.77(44.38-47.16)	63	46.24(43.36-49.12)	90	46.09(43.67-48.51)	100	45.19(43.03-47.35)
Time taken to reach work place (in hour)		253	0.28(0.11-0.45)	63	0.33(0.16-0.51)	90	0.47(0.02-0.92)	100	0.08(0.02-0.14)
Time taken to reach work place (in min)		253	18.32(16.69-19.95)	63	23.48(20.27-26.69)	90	17.72(14.74-20.70)	100	15.61(13.34-17.88)
Indicator	Category	Frequency	% (95% CI)	Frequency	% (95% CI)	Frequency	% (95% CI)	Frequency	% (95% CI)
Type of health facility	Primary Health Centre	156	61.66(55.63-67.69)	42	66.67 (54.70-78.63)	62	68.89 (59.14-78.64)	52	52.00 (42.04-61.96)
	Additional Primary Health Centre	42	16.60(11.98-21.22)	17	26.98 (15.72-38.25)	19	21.11 (12.52-29.71)	6	6.00 (1.26-10.74)
	Community Health Centre	11	4.35(1.82- 6.88)	-	-	1	1.11 (0.00-3.32)	10	10.00 (4.02-15.98)
	Urban Hospital	1	0.40(0.00- 1.17)	1	1.59 (0.00-4.76)	-	-	-	-
	Other	43	17.00(12.34-21.66)	3	4.76 (0.00-10.17)	8	8.89 (2.90-14.88)	32	32.00 (22.70-41.30)
Employment contract	Permanent	114	45.06(38.89-51.23)	18	28.57 (17.10-40.04)	39	43.33 (32.90-53.77)	57	57.00 (47.13-66.87)
	Contractual	139	54.94(48.77-61.11)	45	71.43 (59.96-82.90)	51	56.67 (46.23-67.10)	43	43.00 (33.13-52.87)
Professional degree	AYUSH	73	28.85(23.23-34.47)	27	42.86 (30.29-55.42)	33	36.67 (26.52-46.82)	13	13.00 (6.29-19.71)
	Others	19	7.51(4.24-10.78)	4	6.35 (0.16-12.54)	8	8.89 (2.90-14.88)	7	7.00 (1.91-12.09)
	MBBS	161	63.64(57.67-69.60)	32	50.79 (38.10-63.49)	49	54.44 (43.96-64.93)	80	80.00 (72.02-87.98)

Table 1: General information of the responding physicians in the three studied districts of Bihar, 2019 (N=253)

Description		Overall		Begusarai		Darbhanga		Bhojpur	
		N	Mean (95% CI)	N	Mean (95% CI)	N	Mean (95% CI)	N	Mean (95% CI)
riginal residence	Bihar	251	99.21(98.11-100.0)	63	100.0 (100.0-100.0)	90	100.0 (100.0-100.0)	98	98.00 (95.21-100.0)
	Outside Bihar	2	0.79(0.00- 1.89)	-	-	-	-	2	2.00 (0.00-4.79)
Means to travel to work	By foot	57	22.53(17.35-27.71)	4	6.35 (0.16-12.54)	15	16.67 (8.82-24.52)	38	38.00 (28.32-47.68)
	By public transport	38	15.02(10.59-19.45)	12	19.05 (9.08-29.02)	6	6.67 (1.41-11.92)	20	20.00 (12.02-27.98)
	By own vehicle	158	62.45(56.44-68.46)	47	74.60 (63.55-85.65)	69	76.67 (67.76-85.57)	42	42.00 (32.16-51.84)

Table 2: Physicians' knowledge of IDSP core surveillance functions in the three studied districts of Bihar, 2019 (n=253)

Indicator	Category	Overall		Begusarai		Darbhanga		Bhojpur	
		Frequency	% (95% CI)	Frequency	% (95% CI)	Frequency	% (95% CI)	Frequency	% (95% CI)
Knowledge regarding disease Surveillance	Incorrect	218	86.17(81.88-90.45)	57	90.48 (83.02-97.93)	80	88.89 (82.27-95.51)	81	81.00 (73.18-88.82)
	Correct	35	13.83(9.55-18.12)	6	9.52 (2.07-16.98)	10	11.11 (4.49-17.73)	19	19.00 (11.18-26.82)
Awareness about IDSP	No	35	13.83(9.55-18.12)			29	32.22 (22.38-42.07)	6	6.00 (1.26-10.74)
	Yes	218	86.17(81.88-90.45)	63	100.0 (100.0-100.0)	61	67.78 (57.93-77.62)	94	94.00 (89.26-98.74)
Knowledge regarding main objective of IDSP	Incorrect	113	51.83(45.15-58.52)	6	9.52 (2.07-16.98)	39	63.93 (51.53-76.33)	68	72.34 (63.13-81.55)
	Correct	105	48.17(41.48-54.85)	57	90.48 (83.02-97.93)	22	36.07 (23.67-48.47)	26	27.66 (18.45-36.87)
Knowledge regarding main area where all crucial level of IDSP activities occur	Incorrect	74	33.94(27.61-40.28)	15	23.81 (13.00-34.62)	37	60.66 (48.04-73.27)	22	23.40 (14.69-32.12)
	Correct	144	66.06(59.72-72.39)	48	76.19 (65.38-87.00)	24	39.34 (26.73-51.96)	72	76.60 (67.88-85.31)
Different ways of diagnosis	Poor	16	6.32(3.30-9.34)	1	1.59 (0.00-4.76)	4	4.44 (0.10-8.78)	11	11.00 (4.76-17.24)
	Average	168	66.40(60.54-72.26)	53	84.13 (74.85-93.40)	85	94.44 (89.62-99.27)	30	30.00 (20.86-39.14)
	Good	69	27.27(21.75-32.80)	9	14.29 (5.40-23.17)	1	1.11 (0.00-3.32)	59	59.00 (49.19-68.81)

Table 3: Physicians' knowledge regarding names of diseases under IDSP in the three studied districts of Bihar, 2019 (n=253)

Indicator	Category	Overall		Begusarai		Darbhanga		Bhojpur	
		Frequency	% (95% CI)	Frequency	% (95% CI)	Frequency	% (95% CI)	Frequency	% (95% CI)
Knowledge regarding name of Acute Diarrheal Disease	No	59	23.32(18.07-28.57)	-	-	53	58.89 (48.53-69.25)	6	6.00 (1.26-10.74)
	Yes	194	76.68(71.43-81.93)	63	100.0 (100.0-100.0)	37	41.11 (30.75-51.47)	94	94.00 (89.26-98.74)
Knowledge regarding name of Bacillary Dysentery	No	152	60.08(54.00-66.15)	8	12.70 (4.25-21.15)	83	92.22 (86.58-97.86)	61	61.00 (51.27-70.73)
	Yes	101	39.92(33.85-46.00)	55	87.30 (78.85-95.75)	7	7.78 (2.14-13.42)	39	39.00 (29.27-48.73)
Knowledge regarding name of Viral Hepatitis	No	114	45.06(38.89-51.23)	17	26.98 (15.72-38.25)	72	80.00 (71.58-88.42)	25	25.00 (16.36-33.64)
	Yes	139	54.94(48.77-61.11)	46	73.02 (61.75-84.28)	18	20.00 (11.58-28.42)	75	75.00 (66.36-83.64)
Knowledge regarding name of Enteric Fever	No	85	33.60(27.74-39.46)	11	17.46 (7.82-27.10)	64	71.11 (61.56-80.66)	10	10.00 (4.02-15.98)
	Yes	168	66.40(60.54-72.26)	52	82.54 (72.90-92.18)	26	28.89 (19.34-38.44)	90	90.00 (84.02-95.98)
Knowledge regarding name of Malaria	No	72	28.46(22.86-34.06)	-	-	69	76.67 (67.76-85.57)	3	3.00 (0.00-6.40)
	Yes	181	71.54(65.94-77.14)	63	100.0 (100.0-100.0)	21	23.33 (14.43-32.24)	97	97.00 (93.60-100.0)
Knowledge regarding name of Dengue	No	102	40.32(34.23-46.40)	11	17.46 (7.82-27.10)	81	90.00 (83.68-96.32)	10	10.00 (4.02-15.98)
	Yes	151	59.68(53.60-65.77)	52	82.54 (72.90-92.18)	9	10.00 (3.68-16.32)	90	90.00 (84.02-95.98)
Knowledge regarding name of Chikungunya	No	131	51.78(45.58-57.98)	24	38.10 (25.77-50.42)	85	94.44 (89.62-99.27)	22	22.00 (13.74-30.26)
	Yes	122	48.22(42.02-54.42)	39	61.90 (49.58-74.23)	5	5.56 (0.73-10.38)	78	78.00 (69.74-86.26)
Knowledge regarding name of Acute Encephalitis Syndrome	No	163	64.43(58.49-70.37)	36	57.14 (44.58-69.71)	86	95.56 (91.22-99.90)	41	41.00 (31.19-50.81)
	Yes	90	35.57(29.63-41.51)	27	42.86 (30.29-55.42)	4	4.44 (0.10-8.78)	59	59.00 (49.19-68.81)

Table 3: Physicians' knowledge regarding names of diseases under IDSP in the three studied districts of Bihar, 2019 (n=253)

Indicator	Category	Overall Frequency	Overall % (95% CI)	Begusarai Frequency	Begusarai % (95% CI)	Darbhanga Frequency	Darbhanga % (95% CI)	Bhojpur Frequency	Bhojpur % (95% CI)
Knowledge regarding name of Meningitis	No	121	47.83(41.63-54.02)	18	28.57 (17.10-40.04)	78	86.67 (79.51-93.83)	25	25.00 (16.36-33.64)
	Yes	132	52.17(45.98-58.37)	45	71.43 (59.96-82.90)	12	13.33 (6.17-20.49)	75	75.00 (66.36-83.64)
Knowledge regarding name of Measles	No	41	16.21(11.63-20.78)	-	-	40	44.44 (33.98-54.91)	1	1.00 (0.00-2.98)
	Yes	212	83.79(79.22-88.37)	63	100.0 (100.0-100.0)	50	55.56 (45.09-66.02)	99	99.00 (97.02-100.0)
Knowledge regarding name of Diphtheria	No	122	48.22(42.02-54.42)	11	17.46 (7.82-27.10)	78	86.67 (79.51-93.83)	33	33.00 (23.62-42.38)
	Yes	131	51.78(45.58-57.98)	52	82.54 (72.90-92.18)	12	13.33 (6.17-20.49)	67	67.00 (57.62-76.38)
Knowledge regarding name of Pertussis	No	108	42.69(36.55-48.82)	9	14.29 (5.40-23.17)	81	90.00 (83.68-96.32)	18	18.00 (10.34-25.66)
	Yes	145	57.31(51.18-63.45)	54	85.71 (76.83-94.60)	9	10.00 (3.68-16.32)	82	82.00 (74.34-89.66)
Knowledge regarding name of Chicken Pox	No	102	40.32(34.23-46.40)	2	3.17 (0.00-7.63)	68	75.56 (66.50-84.61)	32	32.00 (22.70-41.30)
	Yes	151	59.68(53.60-65.77)	61	96.83 (92.37-100.0)	22	24.44 (15.39-33.50)	68	68.00 (58.70-77.30)
Knowledge regarding name of Fever of unknown origin	No	181	71.54(65.94-77.14)	23	36.51 (24.29-48.73)	86	95.56 (91.22-99.90)	72	72.00 (63.05-80.95)
	Yes	72	28.46(22.86-34.06)	40	63.49 (51.27-75.71)	4	4.44 (0.10-8.78)	28	28.00 (19.05-36.95)
Knowledge regarding name of Acute Respiratory Infection	No	166	65.61(59.72-71.51)	16	25.40 (14.35-36.45)	83	92.22 (86.58-97.86)	67	67.00 (57.62-76.38)
	Yes	87	34.39(28.49-40.28)	47	74.60 (63.55-85.65)	7	7.78 (2.14-13.42)	33	33.00 (23.62-42.38)
Knowledge regarding name of Pneumonia	No	105	41.50(35.39-47.61)	4	6.35 (0.16-12.54)	79	87.78 (80.88-94.68)	22	22.00 (13.74-30.26)
	Yes	148	58.50(52.39-64.61)	59	93.65 (87.46-99.84)	11	12.22 (5.32-19.12)	78	78.00 (69.74-86.26)

Table 3: Physicians' knowledge regarding names of diseases under IDSP in the three studied districts of Bihar, 2019 (n=253)

Indicator	Category	Overall		Begusarai		Darbhanga		Bhojpur	
		Frequency	% (95% CI)	Frequency	% (95% CI)	Frequency	% (95% CI)	Frequency	% (95% CI)
Knowledge regarding name of Leptospirosis	No	184	72.73(67.20-78.25)	55	87.30 (78.85-95.75)	71	78.89 (70.29-87.48)	58	58.00 (48.16-67.84)
	Yes	69	27.27(21.75-32.80)	8	12.70 (4.25-21.15)	19	21.11 (12.52-29.71)	42	42.00 (32.16-51.84)
Knowledge regarding name of Acute Flaccid Paralysis	No	115	45.45(39.28-51.63)	3	4.76 (0.00-10.17)	70	77.78 (69.02-86.53)	42	42.00 (32.16-51.84)
	Yes	138	54.55(48.37-60.72)	60	95.24 (89.83-100.0)	20	22.22 (13.47-30.98)	58	58.00 (48.16-67.84)
Overall knowledge regarding disease names	Poor	86	33.99(28.12-39.87)	-	-	82	91.11 (85.12-97.10)	4	4.00 (0.09-7.91)
	Average	88	34.78(28.87-40.69)	25	39.68 (27.26-52.10)	8	8.89 (2.90-14.88)	55	55.00 (45.08-64.92)
	Good	79	31.23(25.48-36.97)	38	60.32 (47.90-72.74)	-	-	41	41.00 (31.19-50.81)

Table 4: Physicians' knowledge regarding the standard case definition of diseases under IDSP in the three studied districts of Bihar, 2019 (n=253)

Indicator	Category	Overall		Begusarai		Darbhanga		Bhojpur	
		Frequency	% (95% CI)	Frequency	% (95% CI)	Frequency	% (95% CI)	Frequency	% (95% CI)
Knowledge regarding standard case definition of Acute Diarrheal Disease	Incorrect	101	39.92(33.85-46.00)	-	-	72	80.00 (71.58-88.42)	29	29.00 (19.95-38.05)
	Correct	152	60.08(54.00-66.15)	63	100.0 (100.0-100.0)	18	20.00 (11.58-28.42)	71	71.00 (61.95-80.05)
Knowledge regarding standard case definition of Measles	Incorrect	26	10.28(6.51-14.04)	-	-	17	18.89 (10.64-27.13)	9	9.00 (3.29-14.71)
	Correct	227	89.72(85.96-93.49)	63	100.0 (100.0-100.0)	73	81.11 (72.87-89.36)	91	91.00 (85.29-96.71)
Knowledge regarding standard case definition of Enteric Fever or Typhoid	Incorrect	98	38.74(32.69-44.78)	15	23.81 (13.00-34.62)	42	46.67 (36.16-57.17)	41	41.00 (31.19-50.81)
	Correct	155	61.26(55.22-67.31)	48	76.19 (65.38-87.00)	48	53.33 (42.83-63.84)	59	59.00 (49.19-68.81)
Knowledge regarding standard case definition of Dengue	Incorrect	73	28.85(23.23-34.47)	13	20.63 (10.36-30.91)	30	33.33 (23.40-43.26)	30	30.00 (20.86-39.14)
	Correct	180	71.15(65.53-76.77)	50	79.37 (69.09-89.64)	60	66.67 (56.74-76.60)	70	70.00 (60.86-79.14)
Knowledge regarding standard case definition of Acute Encephalitis Syndrome	Incorrect	92	36.36(30.40-42.33)	37	58.73 (46.23-71.23)	33	36.67 (26.52-46.82)	22	22.00 (13.74-30.26)
	Correct	161	63.64(57.67-69.60)	26	41.27 (28.77-53.77)	57	63.33 (53.18-73.48)	78	78.00 (69.74-86.26)

Table 4: Physicians' knowledge regarding the standard case definition of diseases under IDSP in the three studied districts of Bihar, 2019 (n=253)

Indicator	Category	Overall		Begusarai		Darbhanga		Bhojpur	
		Frequency	% (95% CI)	Frequency	% (95% CI)	Frequency	% (95% CI)	Frequency	% (95% CI)
Knowledge regarding standard case definition of Viral Hepatitis	Incorrect	89	35.18(29.25-41.10)	22	34.92 (22.82-47.02)	42	46.67 (36.16-57.17)	25	25.00 (16.36-33.64)
	Correct	164	64.82(58.90-70.75)	41	65.08 (52.98-77.18)	48	53.33 (42.83-63.84)	75	75.00 (66.36-83.64)
Overall knowledge regarding standard case definition based on tertile distribution	Poor	85	33.60(27.74-39.46)	16	25.40 (14.35-36.45)	44	48.89 (38.36-59.42)	25	25.00 (16.36-33.64)
	Average	110	43.48(37.33-49.63)	26	41.27 (28.77-53.77)	40	44.44 (33.98-54.91)	44	44.00 (34.10-53.90)
	Good	58	22.92(17.71-28.14)	21	33.33 (21.37-45.30)	6	6.67 (1.41-11.92)	31	31.00 (21.78-40.22)

Table 5: Physicians' knowledge of trigger levels for epidemic prone diseases under IDSP in the three studied districts of Bihar, 2019

Indicator	Category	Overall		Begusarai		Darbhanga		Bhojpur	
		Frequency	% (95% CI)	Frequency	% (95% CI)	Frequency	% (95% CI)	Frequency	% (95% CI)
Knowledge regarding trigger level	Yes	199	78.66(73.57-83.74)	63	100.0 (100.0-100.0)	43	47.78 (37.26-58.30)	93	93.00 (87.91-98.09)
	No	39	15.42(10.94-19.89)	-	-	37	41.11 (30.75-51.47)	2	2.00 (0.00-4.79)
	Don't Know	15	5.93(3.00- 8.86)	-	-	10	11.11 (4.49-17.73)	5	5.00 (0.65-9.35)
Knowledge regarding the trigger level for Acute Diarrheal Disease	Incorrect	184	72.73(67.20-78.25)	40	63.49 (51.27-75.71)	69	76.67 (67.76-85.57)	75	75.00 (66.36-83.64)
	Correct	69	27.27(21.75-32.80)	23	36.51 (24.29-48.73)	21	23.33 (14.43-32.24)	25	25.00 (16.36-33.64)
Knowledge regarding the trigger level for Viral Hepatitis	Incorrect	193	76.28(71.01-81.56)	31	49.21 (36.51-61.90)	87	96.67 (92.89-100.0)	75	75.00 (66.36-83.64)
	Correct	60	23.72(18.44-28.99)	32	50.79 (38.10-63.49)	3	3.33 (0.00-7.11)	25	25.00 (16.36-33.64)
Knowledge regarding the trigger level for Enteric Fever or Typhoid	Incorrect	226	89.33(85.50-93.16)	51	80.95 (70.98-90.92)	88	97.78 (94.67-100.0)	87	87.00 (80.29-93.71)
	Correct	27	10.67(6.84-14.50)	12	19.05 (9.08-29.02)	2	2.22 (0.00-5.33)	13	13.00 (6.29-19.71)
Knowledge regarding the trigger level for Measles	Incorrect	135	53.36(47.17-59.55)	24	38.10 (25.77-50.42)	80	88.89 (82.27-95.51)	31	31.00 (21.78-40.22)
	Correct	118	46.64(40.45-52.83)	39	61.90 (49.58-74.23)	10	11.11 (4.49-17.73)	69	69.00 (59.78-78.22)
Knowledge regarding the trigger level for Dengue	Incorrect	126	49.80(43.60-56.01)	10	15.87 (6.60-25.15)	72	80.00 (71.58-88.42)	44	44.00 (34.10-53.90)
	Correct	127	50.20(43.99-56.40)	53	84.13 (74.85-93.40)	18	20.00 (11.58-28.42)	56	56.00 (46.10-65.90)
Overall knowledge regarding trigger level	Poor	81	32.02(26.23-37.80)	6	9.52 (2.07-16.98)	55	61.11 (50.84-71.38)	20	20.00 (12.02-27.98)
	Average	109	43.08(36.94-49.23)	22	34.92 (22.82-47.02)	32	35.56 (25.47-45.64)	55	55.00 (45.08-64.92)
	Good	63	24.90(19.54-30.27)	35	55.56 (42.94-68.17)	3	3.33 (0.00-7.11)	25	25.00 (16.36-33.64)

Table 6: Physicians' knowledge of the reporting formats under the IDSP in the three studied districts of Bihar, 2019 (n=253)

Indicator	Category	Overall Frequency	Overall % (95% CI)	Begusarai Frequency	Begusarai % (95% CI)	Darbhanga Frequency	Darbhanga % (95% CI)	Bhojpur Frequency	Bhojpur % (95% CI)
Knowledge regarding reporting format under IDSP	Incorrect	221	87.35(83.23-91.48)	61	96.83 (92.37-100.0)	80	88.89 (82.27-95.51)	80	80.00 (72.02-87.98)
	Correct	32	12.65(8.52-16.77)	2	3.17 (0.00-7.63)	10	11.11 (4.49-17.73)	20	20.00 (12.02-27.98)
Knowledge regarding the name of the specific disease reporting form	Incorrect	219	86.56(82.33-90.79)	54	85.71 (76.83-94.60)	85	94.44 (89.62-99.27)	80	80.00 (72.02-87.98)
	Correct	34	13.44(9.21-17.67)	9	14.29 (5.40-23.17)	5	5.56 (0.73-10.38)	20	20.00 (12.02-27.98)
Knowledge regarding number of reporting forms generated	Number	66	26.09(20.64-31.53)	24	38.10 (25.77-50.42)	15	16.67 (8.82-24.52)	27	27.00 (18.15-35.85)
	Don't know	187	73.91(68.47-79.36)	39	61.90 (49.58-74.23)	75	83.33 (75.48-91.18)	73	73.00 (64.15-81.85)
	Don't know & Immediate basis	162	64.03(58.08-69.99)	7	11.11 (3.13-19.09)	79	87.78 (80.88-94.68)	76	76.00 (67.48-84.52)
Knowledge regarding data collection	Weekly basis (Monday & Sunday)	86	33.99(28.12-39.87)	54	85.71 (76.83-94.60)	9	10.00 (3.68-16.32)	23	23.00 (14.61-31.39)
	Both weekly and immediate basis	5	1.98(0.25- 3.70)	2	3.17 (0.00-7.63)	2	2.22 (0.00-5.33)	1	1.00 (0.00-2.98)

Table 6: Physicians' knowledge of the reporting formats under the IDSP in the three studied districts of Bihar, 2019 (n=253)

Indicator	Category	Overall		Begusarai		Darbhanga		Bhojpur	
		Frequency	% (95% CI)	Frequency	% (95% CI)	Frequency	% (95% CI)	Frequency	% (95% CI)
Knowledge regarding data collation	Paramedi-cal staff (Pharma-cists)	16	6.32(3.30- 9.34)	-	-	5	5.56 (0.73-10.38)	11	11.00 (4.76-17.24)
	Block Health Manager	62	24.51(19.17-29.84)	54	85.71 (76.83-94.60)	1	1.11 (0.00-3.32)	7	7.00 (1.91-12.09)
	Data Entry Operator	33	13.04(8.87-17.22)	5	7.94 (1.07-14.80)	23	25.56 (16.37-34.74)	5	5.00 (0.65-9.35)
	Don't know	133	52.57(46.37-58.76)	4	6.35 (0.16-12.54)	58	64.44 (54.36-74.53)	71	71.00 (61.95-80.05)
	Other	9	3.56(1.26- 5.86)	-	-	3	3.33 (0.00-7.11)	6	6.00 (1.26-10.74)
Knowledge regarding data storage	Scanned and stored digitally	8	3.16(0.99- 5.33)	1	1.59 (0.00-4.76)	5	5.56 (0.73-10.38)	2	2.00 (0.00-4.79)
	In a color-coded form	23	9.09(5.52-12.66)	1	1.59 (0.00-4.76)	2	2.22 (0.00-5.33)	20	20.00 (12.02-27.98)
	In a separate register	57	22.53(17.35-27.71)	56	88.89 (80.91-96.87)	1	1.11 (0.00-3.32)	-	-
	No idea	164	64.82(58.90-70.75)	5	7.94 (1.07-14.80)	81	90.00 (83.68-96.32)	78	78.00 (69.74-86.26)

Table 7: Physicians' knowledge of outbreak investigation & outbreak detection in the three studied districts of Bihar, 2019

Indicator	Category	Overall		Begusarai		Darbhanga		Bhojpur	
		Frequency	% (95% CI)	Frequency	% (95% CI)	Frequency	% (95% CI)	Frequency	% (95% CI)
Detection of unusual clustering	Clustering of cases from the same locality on a given day or consecutive days	107	42.29(36.16-48.42)	43	68.25(56.44-80.07)	26	28.89 (19.34-38.44)	38	38.00 (28.32-47.68)
	Media reports	2	0.79(0.00- 1.89)	1	1.59 (0.00-4.76)			1	1.00 (0.00-2.98)
	Information reaching from the affected community	74	29.25(23.61-34.89)	13	20.63 (10.36-30.91)	18	20.00 (11.58-28.42)	43	43.00 (33.13-52.87)
	All of the above	28	11.07(7.18-14.96)	6	9.52 (2.07-16.98)	8	8.89 (2.90-14.88)	14	14.00 (7.08-20.92)
	Other	42	16.60(11.98-21.22)			38	42.22 (31.82-52.62)	4	4.00 (0.09-7.91)
Usual time response to outbreak	Within 24 hours	238	94.07(91.14-97.00)	52	82.54 (72.90-92.18)	87	96.67 (92.89-100.0)	99	99.00 (97.02-100.0)
	Between 24 and 48 hours	10	3.95(1.54- 6.37)	8	12.70 (4.25-21.15)	1	1.11 (0.00-3.32)	1	1.00 (0.00-2.98)
	Beyond 48 hours	3	1.19(0.00- 2.53)	3	4.76 (0.00-10.17)	.	.	.	.
	In most of the times no response	2	0.79(0.00- 1.89)	.	.	2	2.22 (0.00-5.33)	.	.

Table 7: Physicians' knowledge of outbreak investigation & outbreak detection in the three studied districts of Bihar, 2019

Indicator	Category	Overall		Begusarai		Darbhanga		Bhojpur	
		Frequency	% (95% CI)	Frequency	% (95% CI)	Frequency	% (95% CI)	Frequency	% (95% CI)
Transmission of information related to outbreak to the next higher level	Pharmacist/ Block health manager immediately report to District Surveillance Officer over phone	159	62.85(56.85-68.84)	11	17.46 (7.82-27.10)	57	63.33 (53.18-73.48)	91	91.00 (85.29-96.71)
	Pharmacist /Block health manager generate a report & submit it to District Surveillance Officer	74	29.25(23.61-34.89)	50	79.37 (69.09-89.64)	19	21.11 (12.52-29.71)	5	5.00 (0.65-9.35)
	Don't Know	10	3.95(1.54- 6.37)	1	1.59 (0.00-4.76)	8	8.89 (2.90-14.88)	1	1.00 (0.00-2.98)
	Other (specify)	10	3.95(1.54- 6.37)	1	1.59 (0.00-4.76)	-	-	3	3.00 (0.00-6.40)

Table 8: Physicians' knowledge of outbreak preparedness and response in the three studied districts of Bihar, 2019 (n=253)

Indicator	Category	Overall		Begusarai		Darbhanga		Bhojpur	
		Frequency	% (95% CI)	Frequency	% (95% CI)	Frequency	% (95% CI)	Frequency	% (95% CI)
Knowledge regarding approach to exploring risk factor: Interacting with Index case and family members	Yes, but not always, No	96	37.94(31.92-43.96)	31	49.21 (36.51-61.90)	58	64.44 (54.36-74.53)	7	7.00 (1.91-12.09)
	Yes, always	157	62.06(56.04-68.08)	32	50.79 (38.10-63.49)	32	35.56 (25.47-45.64)	93	93.00 (87.91-98.09)
Knowledge regarding approach to exploring risk factor: Timely survey	Yes, but not always, No	77	30.43(24.73-36.14)	14	22.22 (11.67-32.78)	48	53.33 (42.83-63.84)	15	15.00 (7.88-22.12)
	Yes, always	176	69.57(63.86-75.27)	49	77.78 (67.22-88.33)	42	46.67 (36.16-57.17)	85	85.00 (77.88-92.12)
Knowledge regarding approach to exploring risk factor: Sending water supply	Yes, but not always, No	155	61.26(55.22-67.31)	44	69.84 (58.19-81.49)	77	85.56 (78.15-92.96)	34	34.00 (24.55-43.45)
	Yes, always	98	38.74(32.69-44.78)	19	30.16 (18.51-41.81)	13	14.44 (7.04-21.85)	66	66.00 (56.55-75.45)
Knowledge regarding approach to exploring risk factor: Checking immunization coverage	Yes, but not always, No	152	60.08(54.00-66.15)	10	15.87 (6.60-25.15)	83	92.22 (86.58-97.86)	59	59.00 (49.19-68.81)
	Yes, always	101	39.92(33.85-46.00)	53	84.13 (74.85-93.40)	7	7.78 (2.14-13.42)	41	41.00 (31.19-50.81)

Table 8: Physicians' knowledge of outbreak preparedness and response in the three studied districts of Bihar, 2019 (n=253)

Indicator	Category	Overall Frequency	Overall % (95% CI)	Begusarai Frequency	Begusarai % (95% CI)	Darbhanga Frequency	Darbhanga % (95% CI)	Bhojpur Frequency	Bhojpur % (95% CI)--
Knowledge regarding approach to exploring risk factor: Checking mode of defecation	Yes, but not always	109	43.08(36.94-49.23)	6	9.52 (2.07-16.98)	80	88.89 (82.27-95.51)	23	23.00 (14.61-31.39)
	Yes, always	144	56.92(50.77-63.06)	57	90.48 (83.02-97.93)	10	11.11 (4.49-17.73)	77	77.00 (68.61-85.39)
Overall knowledge regarding exploring risk factors	Poor	92	36.36(30.40-42.33)	8	12.70 (4.25-21.15)	73	81.11 (72.87-89.36)	11	11.00 (4.76-17.24)
	Average	85	33.60(27.74-39.46)	27	42.86 (30.29-55.42)	17	18.89 (10.64-27.13)	41	41.00 (31.19-50.81)
	Good	76	30.04(24.35-35.73)	28	44.44 (31.83-57.06)	-	-	48	48.00 (38.04-57.96)
Knowledge regarding outbreak preparedness & response	Poor	104	41.11(35.00-47.21)	5	7.94 (1.07-14.80)	78	86.67 (79.51-93.83)	21	21.00 (12.88-29.12)
	Average	87	34.39(28.49-40.28)	26	41.27 (28.77-53.77)	12	13.33 (6.17-20.49)	49	49.00 (39.03-58.97)
	Good	62	24.51(19.17-29.84)	32	50.79 (38.10-63.49)	-	-	30	30.00 (20.86-39.14)
Exploration of risk factors during an outbreak	Yes	106	41.90(35.78-48.02)	47	74.60 (63.55-85.65)	17	18.89 (10.64-27.13)	42	42.00 (32.16-51.84)
	No	27	10.67(6.84-14.50)	-	-	10	11.11 (4.49-17.73)	17	17.00 (9.51-24.49)
	Outbreak did not happen during my tenure	120	47.43(41.24-53.63)	16	25.40 (14.35-36.45)	63	70.00 (60.35-79.65)	41	41.00 (31.19-50.81)

Table 9: Factors effecting Physicians' knowledge of IDSP in the three studied districts of Bihar, 2019 (n=253)

Description	Categories		Overall Knowledge (Reference=Poor)				
			Average		Good		
			OR (95% CI)	P-Value	OR (95% CI)	P-Value	
Doctor's Age	-	UOR*	1.01(0.99- 1.04)	0.3791	1.02(0.99- 1.05)	0.1495	
		AOR*	1.01(0.98- 1.03)	0.6335	1.00(0.97- 1.04)	0.7688	
Doctor's Professional degree (Reference=Ayush)	Others	UOR	1.49(0.51- 4.32)	0.462	0.41(0.05- 3.59)	0.4204	
		AOR	1.83(0.61- 5.48)	0.2803	0.65(0.07- 5.92)	0.7056	
	MBBS	UOR	2.00(1.06- 3.80)	0.0329	3.95(1.79- 8.70)	0.0007	
		AOR	2.20(1.14- 4.27)	0.0192	4.96(2.14-11.47)	0.0002	
Received formal training on IDSP (Reference=No)	Yes	UOR	1.54(0.74- 3.21)	0.2528	2.62(1.23- 5.56)	0.0122	
		AOR	1.79(0.81- 3.98)	0.1499	3.25(1.39- 7.65)	0.0068	

Discussion

Rapid notification of infectious diseases is essential for prompt public health action and for monitoring of disease trends at the local, state and national levels. The major challenges of the integrated approach towards surveillance system in developing countries included lack of awareness, ignorance of notifiable diseases, outbreak detection and response among the medical officers.[17]To the best of our knowledge, this was the first study that assessed the knowledge and awareness of physicians involved with IDSP reporting and supervision in Bihar to better understand the scope of interventions to strengthen the surveillance program in the state.

It was observed that on an average the physicians had 5 years of exposure in disease reporting and supervision in IDSP. In Bhojpur, the majority of the participants had MBBS degree while in the other two districts had both MBBS and non-MBBS doctors. Non-MBBS doctors have been associated with PHCs for a long time in the country. Most of them are contractual employees who were first recruited to provide AYUSH treatment and gradually utilized as primary care givers in remote PHCs. [25-27]The non-availability of regular staffs and specialists against the regular sanctioned posts might be a major hindrance in operationalizing the surveillance activities in the state. Furthermore, large number of vacancies for all categories of health care providers and irregular supply of contractual staff seriously affected the IDSP implementation (data not shown here). Thus, recruiting a regular public health workforce, establishing a protocol for performance appraisal and real-time workforce management might help to better achieve the program objectives.

Even as majority of the respondents had heard about the IDSP, knowledge regarding infectious disease surveillance was abysmally low. In Begusarai, the majority of the doctors knew about the objectives of IDSP than those in Darbhanga and Bhojpur. A large number of the clinicians in Darbhanga had poor understanding of the IDSP infrastructure and functions in comparison to the other two districts. A study in Maharashtra also revealed inadequate knowledge about IDSP reporting among physicians.[28] Similarly, identification of cases through proper case definition was lacking in majority of the participants, particularly in Darbhanga. Knowledge regarding the case definitions of acute encephalopathy syndrome (AES), acute diarrheal diseases (ADD) and enteric fever or typhoid was inadequate among the physicians. This is of great concern as AES and ADD were identified as the major contributing factors to most of recurring outbreaks leading to significant mortality and morbidity in the state.[29-31]

Good knowledge regarding trigger levels for epidemic-prone diseases was also deficient among the clinicians especially in the districts of Darbhanga and Bhojpur. A study conducted in West Bengal on ADD and IDSP reporting also indicated poor knowledge among physicians with regard to case definition and trigger levels of communicable diseases.[32] Most of the physicians did not know about the IDSP reporting format in all the three districts. In Darbhanga and Bhojpur, most physicians had no knowledge regarding data collection, collation, storage. These findings corroborated with those reported from other countries and other states of India.[33-35]

Overall awareness regarding control measures during an outbreak was poor among the medical officers in all three districts and specially among the physicians of Darbhanga. Despite more than 15 years of IDSP implementation in India, till date the country is lagging in detection and early response to outbreaks.[36]

Another important finding that emerged from the study was that IDSP-related overall knowledge was relatively better among the MBBS degree holders than AYUSH practitioners and among those who received formal training on IDSP. Knowledge regarding emerging infectious diseases was found to be low among AYUSH practitioners in a previous study also.[37] Earlier studies had compared the knowledge and performance of AYUSH physicians in medical sciences against qualified practitioners of modern medicine but not on knowledge regarding disease surveillance.[26] Training regarding IDSP could be an effective tool to improve the knowledge and awareness among both AYUSH and MBBS doctors in the state.

The current study had some limitations. Being a cross sectional study, causal inference between the different independent variables and knowledge of physicians on IDSP would be misleading. Interpretation of findings beyond the study area should be done with caution as respondents were from three randomly selected districts. Despite these limitations, this study was the first to assess the knowledge and awareness of physicians in the public health set-up of Bihar regarding the IDSP and explored the predictors of relatively better IDSP-related knowledge.

Conclusion

Findings revealed that a relatively high percentage of physicians had insufficient knowledge of surveillance and reporting of notifiable communicable diseases in Bihar. Regular training of physicians on surveillance in general, case definition and disease notification is needed and should be strictly enforced, particularly among the non-MBBS degree holders so that they could respond to the disease outbreaks in a timely manner.

Recommendation:

Based on learnings from this study, the following recommendations are made that would improve the productivity and engagement altogether culminating into improved health outcomes.

- Orientation of recently recruited medical doctors to overall scenario of communicable diseases in Bihar, existing control programs including IDSP and specific workflow within the system by experienced senior doctors (Civil Surgeon, Additional Chief Medical officers) at the district level

- Organizing physician-training programs at the district and state levels clarifying their specific roles and responsibilities related to routine surveillance activities and outbreak investigation process

- Physicians should be aware of basic case definition of communicable diseases endemic to Bihar and management of probable cases

- Basic hands-on training should be provided to health care providers regarding data related to IDSP, database management, analysis and interpretation of disease trend, any outbreak etc.

- Display of effective training materials at respective health centers for example case definition, trigger levels, case-specific management etc.

- Provision of online interactive training sessions in local language at the state IDSP website

Reference:

1. India Population (2020). Worldometer. https://www.worldometers.info/world-population/india-population/.

2. Kambrath, S.V. and M.J.I.J.o.C.R.i.L.S. Deshmukh, The burden of Infectious diseases in India-An overview. 2018. 7(06): p. 2237-2240.

3. Arokiasamy, P.J.T.L.G.H., India's escalating burden of non-communicable diseases. 2018. 6(12): p. e1262-e1263.

4. Nichter, M. and D. Van Sickle, The challenges of India's health and health care transitions, in India Briefing. 2016, Routledge. p. 171-208.

5. Lobo, D.A., et al., The Neglected Tropical Diseases of India and South Asia: Review of Their Prevalence, Distribution, and Control or Elimination. PLOS Neglected Tropical Diseases, 2011. 5(10): p. e1222.

6. Erlanger, T.E., et al., Past, present, and future of Japanese encephalitis. 2009. 15(1): p. 1.

7. Battle, K.E., et al., Mapping the global endemicity and clinical burden of Plasmodium vivax, 2000-17: a spatial and temporal modelling study. The Lancet, 2019. 394(10195): p. 332-343.

8. Cibulskis, R.E., et al., Malaria: Global progress 2000 - 2015 and future challenges. Infectious Diseases of Poverty, 2016. 5(1): p. 61.

9. Wolf, J., et al., Impact of drinking water, sanitation and handwashing with soap on childhood diarrhoeal disease: updated meta?analysis and meta?regression. 2018. 23(5): p. 508-525.

10. Sharma, D.C.J.T.L., New plan to end tuberculosis in south and southeast Asia. 2017. 389(10075): p. 1183.

11. Tullu, M.S. and S.J.I.j.o.m.s. Karande, Leptospirosis in children: a review for family physicians. 2009. 63(8).

12. Chaturvedi, U. and R.J.J.o.b. Nagar, Dengue and dengue haemorrhagic fever: Indian perspective. 2008. 33(4): p. 429-441.

13. Kant, L.J.J.o.b., Combating emerging infectious diseases in India: Orchestrating a symphony. 2008. 33(4): p. 425-427.

14. Dikid, T., et al., Emerging & re-emerging infections in India: an overview. Indian J Med Res, 2013. 138(1): p. 19-31.

15. M'ikanatha, N.M., et al., Infectious disease surveillance: a cornerstone for prevention and control. 2007: p. 1-17.

16. Gauci, C., et al., General practitioners role in the notification of communicable diseases - study in Malta. Euro Surveill, 2007. 12(11): p. E5-6.

17. Abdulrahim, N., et al., Knowledge, Awareness, and Compliance of Disease Surveillance and Notification Among Jordanian Physicians in Residency Programs. Inquiry, 2019. 56: p. 46958019856508.

18. Buehler, J., et al., CDC Worldng Group. Framework for evaluating public health surveillance systems for early detection of outbreaks. 2004. 53: p. 1-11.

19. Abdulraheem, L., et al., Disease notification among physicians in a Nigerian Tertiary Health Institution. 2004. 45(6): p. 111-115.

20. Integrated Disease Surveillance Programme. National Center for Disease Control, Directorate General of Health Services. Ministry of Health & Family Welfare, Government of India. Available at: https://idsp.nic.in/.

21. Gauci, C., et al., General practitioners role in the notification of communicable diseases-study in Malta. 2007. 12(11): p. E5-6.

22. Trottier, H., H. Carabin, and P.J.R.d.e.e.d.s.p. Philippe, Measles, pertussis, rubella and mumps completeness of reporting. Literature review of estimates for industrialized countries. 2006. 54(1): p. 27-39.

23. Integrated Disease Surveillance Project. State Health Society, Bihar. Available at: http://statehealthsocietybihar.org/idsp.html.

24. Nnebue, C.C., et al., Awareness and knowledge of disease surveillance and notification by health-care workers and availability of facility records in Anambra state, Nigeria. 2012. 53(4): p. 220.

25. Priya, R. and S.A. Saxena, Status and role of AYUSH and local health traditions under the National Rural Health Mission. 2010.

26. Rao, K.D., et al., Which doctor for primary health care? Quality of care and non-physician clinicians in India. 2013. 84: p. 30-34.

27. Chandra, S. and K. Patwardhan, Allopathic, AYUSH and informal medical practitioners in rural India - a prescription for change. Journal of Ayurveda and Integrative Medicine, 2018. 9(2): p. 143-150.

28. Shinde, R.R., et al., To develop a public private partnership model of disease

notification as a part of integrated disease surveillance project (IDSP) for private medical practitioners in Mumbai City, India. 2012. 1(6): p. 1-11.

29. Dinesh, D.S., et al., Chandipura Virus Recognized among AES for the First Time in Bihar, India. 2018. 7(12): p. 3658-3663.

30. Kumar, P., et al., Status and trend of acute encephalitis syndrome and Japanese encephalitis in Bihar, India. 2017. 30(6): p. 317.

31. Morris, S.K., et al., Diarrhea, Pneumonia, and Infectious Disease Mortality in Children Aged 5 to 14 Years in India. PLOS ONE, 2011. 6(5): p. e20119.

32. Debnath, F. and M. Ponnaiah, Improved timeliness for reporting of acute diarrhoeal disease under surveillance overtime: Evaluation of integrated disease surveillance programme in North 24 Parganas, West Bengal, India, 2015. Clinical Epidemiology and Global Health, 2018. 6(4): p. 163-167.

33. Abubakar, A.Z., Nigeria: Masters in Public Health, Ahmadu Bello University, Assessment of Integrated Disease Surveillance and response (IDSR) implementation in selected LGA's in Kaduna state. 2010.

34. Rumisha, S., et al., Monitoring and evaluation of integrated disease surveillance and response in selected districts in Tanzania. 2007. 9(1): p. 1-11.

35. Phalkey, R.K., et al., Assessment of the core and support functions of the Integrated Disease Surveillance system in Maharashtra, India. BMC Public Health, 2013. 13(1): p. 575.

36. Gaur, K., et al., Integrated Disease Surveillance Programme (IDSP) Disease Pattern and its Load on a tertiary level Hospital: A Cross-Sectional Study. 2015. 1(8): p. 40-6.

37. Vikhe, M.R., N.R. Relwani, and S. Anjenaya, A cross-sectional study to assess knowledge, attitude and practices regarding H1N1 among AYUSH practioners at Panvel taluka. 2017, 2017. 4(10): p. 5 %J International Journal Of Community Medicine And Public Health.

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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.