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Inside

Person-to-person transmission of Nipah infection in Bangladesh, 2007

Two outbreaks of encephalitis, both caused by Nipah viruses, occurred in separate areas of western Bangladesh in 2007. Each outbreak lasted <3 weeks and had high (43% and 63%) case-fatality ratios. In both the outbreaks cases were clustered in time and place with a secondary peak of cases following the initial cases suggesting person-to-person transmission. The capacity of the virus to spread from human to human increases the need for enhanced infection prevention measures in a densely populated country such as Bangladesh.

Five outbreaks of Nipah virus were recognized in Bangladesh between 2001 and 2005, all occurring from January to May in the north and western parts of the country (1-4). (Figure 1) From February 2006, the Institute for Epidemiology Disease Control and Research (IEDCR) of the Government of Bangladesh, in collaboration with ICDDR,B, established surveillance for Nipah infection in 10 hospitals covering locations where Nipah outbreaks have been repeatedly identified.

icddr,b

KNOWLEDGE FOR GLOBAL LIFESAVING SOLUTIONS

Figure 1: Location of Nipah outbreaks, Bangladesh 2001-2007

Two outbreaks of febrile illness progressing to fatal encephalitis were reported to IEDCR between January and April 2007. The first outbreak was reported on 10 February by a physician trained in Nipah surveillance and working in Rangpur Medical College Hospital. A woman aged 25 who resided in the Haripur Upazilla of Thakurgaon District was admitted with a clinical diagnosis of encephalitis. She first developed fever on 4 February; her illness progressed to include headache, difficulty breathing, convulsions, loss of consciousness and death on 10 February. Upon questioning, family members reported that her husband had died from a similar illness during the previous week. The second outbreak was reported on 9 April 2007 by the local health authority in Kushtia District who noted five recent deaths among previously healthy residents of Sadar Upazilla. Upon notification of each of these clusters of deaths, an investigation team jointly staffed by IEDCR and ICDDR,B was immediately assembled to investigate. The team collected illness histories on all residents in the outbreak villages meeting a suspect case definition of febrile illness with headache or cough during the outbreak period. Blood and throat swabs were also collected from living suspect cases.

The investigation team defined a confirmed Nipah case by the presence of IgM antibodies to Nipah virus in serum and a probable case as a patient who concurrently had symptoms similar to confirmed cases and resided in the same area, but from whom blood was not collected due to death. A total of seven cases (5 confirmed and 2 probable) were identified in Thakurgaon and eight cases (3 confirmed and 5 probable) from Kushtia. For each case the field investigating team identified three unmatched controls from the same neighborhood and collected data from both cases and controls to attempt to identify risk factors associated with acquiring Nipah infection.

In Thakurgaon, the first case-patient became ill on 21 January, 2007. Six additional people experienced onset of symptoms through 8 February (Figure 1). The median duration from onset of fever to death was 5.6 (range 5-7) days. In the Kushtia outbreak, the first illness occurred on 17 March, and was followed by a cluster of 7 cases from 29 March to 3 April (Figure 2). The median duration from onset of illness to death in this cluster was 4 days. In both outbreaks, the cases were closely clustered in place and time and were either relatives of or in the same peer circle as the index cases.

Figure 2: Dates of onset of illness of Nipah cases in Thakurgaon, 2007

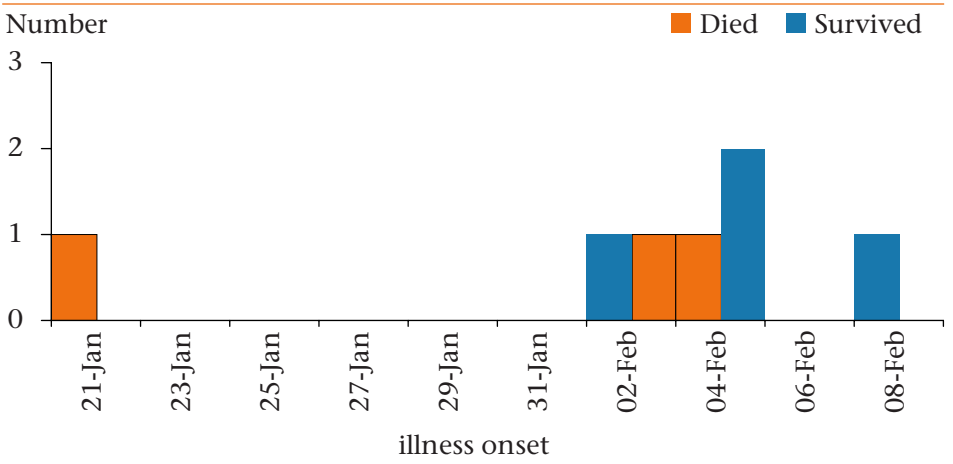
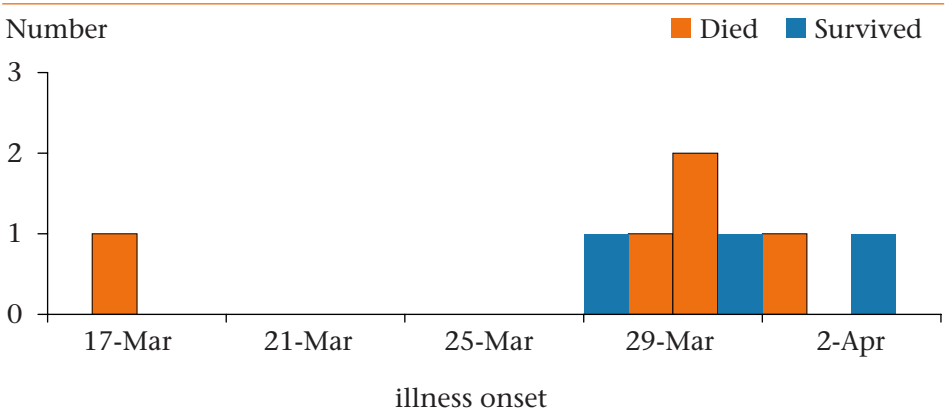


Figure 3: Dates of onset of illness of Nipah cases in Kushtia, 2007



Fever, headache, and altered consciousness, along with cough and severe weakness, were the most common symptoms (Table 1). In the Thakurgaon outbreak, cases were more likely than controls to be in the same room with an ill Nipah case (86% versus 9.5%). Nipah cases in Kushtia were more likely than controls to have touched someone who was ill (50% versus 0%).

Table 1: Socio-demographic and clinical presentation of Nipah cases by outbreak

Characteristics	Thakurgaon (N=7)	Kushtia (N=8)
Age: Median (range)	24 (19-30)	35 (27-55)
Male n (%)	5 (71)	2 (25)
Clinical features n (%)		
Fever	7 (100)	8 (100)
Severe fatigue/weakness	6 (86)	7 (88)
Headache	3 (43)	6 (75)
Vomiting	5 (71)	5 (63)
Cough	5 (71)	5 (63)
Respiratory distress	4 (57)	5 (63)
Altered mental status	5 (71)	5 (63)
Muscle pain	4 (57)	5 (63)
Restlessness	4 (57)	4 (50)
Unconscious	2 (29)	3 (38)
Joint pain	1 (14)	3 (38)
Case fatality n (%)	3 (43)	5 (62)
Range in days of illness onset to death	5-7	1-7

Reported by: Institute of Epidemiology Disease Control and Research, Ministry of Health and Family Welfare, Government of Bangladesh, Clinical Sciences Division and Health Systems and Infectious Diseases Division, ICDDR,B

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Comment

These outbreaks were both caused by Nipah virus. The clinical presentation with a primary presentation of fever, weakness and mental status changes was similar to that noted in prior outbreaks (1,2). The pattern of these outbreaks was also similar to previous Nipah outbreaks with several previously healthy people who live near each other suddenly becoming seriously ill. These outbreaks represent the sixth and seventh outbreaks of human Nipah virus infection recognized in Bangladesh since 2001.

The source of infection of the index case in both outbreaks is unclear, but subsequent infections appear to have been the result of person to person transmission. Cases were clustered among family members, neighbors and peer groups, with secondary peaks of cases 12 – 13 days after the index case. Subsequent cases were more likely to have exposure to the index case while he/she was ill than controls. Prior investigations in Bangladesh provide persuasive evidence of person-to-person transmission of Nipah virus (3).

Central and northwest Bangladesh remain at risk for future outbreaks of Nipah virus especially in January through May. When clinicians see patients with fever and mental status change, they should inquire if anyone else in their community has experienced a similar illness in the preceding two weeks. Any clustering encephalitis cases should be immediately reported to the district health authority.

The repeated outbreaks of Nipah virus in Bangladesh that result from person to person transmission underscore the importance of developing strategies to interrupt the transmission of saliva transmitted viruses, both in the home and in hospitals. Washing hands after contact with Nipah patients has protected against transmission in prior outbreaks (5). Appropriate isolation of Nipah patients interrupted hospital transmission in a large Nipah outbreak in Siliguri, India (6).

Culturally sensitive health messages are needed to create awareness about the potential communicability of disease among persons who care for their critically ill family members. Basic preventive measures such as hand washing, not sharing beds or food and, minimizing the number of contacts can limit person to person transmission of Nipah virus.

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Post kala-azar dermal leishmaniasis: New observations challenge previous assumptions

Post-kala-azar dermal leishmaniasis, or PKDL, is a variable skin manifestation seen in a proportion of treated kala-azar patients, usually after resolution of systemic symptoms. Though historically long recognized and felt to be a critical component of the visceral leishmaniasis transmission cycle, the epidemiologic and clinical features of the phenomenon remain poorly understood. Initial findings in an ongoing active surveillance study in Fulbaria, Mymensingh, reveal PKDL rates as high as 18% in recently treated kala-azar patients, that the majority of PKDL patients present with skin lesions within 2 years of being treated for kala-azar, and that several affected patients have achieved clinical resolution without completing the recommended regimen of 6 months of sodium antimony gluconate (SAG) injections. These preliminary observations put into question several basic assumptions of PKDL - around rates of disease, clinical patterns, and treatment requirements – and urge further research and reconsideration of existing control efforts.

Visceral leishmaniasis, or kala-azar as it is commonly known, is a sandfly transmitted parasitic illness marked by prolonged fever, splenomegaly, anorexia, and wasting. Considered to be a major neglected tropical disease in South Asia, kala-azar has resurged in endemic regions of Bangladesh since the 1990s, with the highest rates in the districts of Mymensingh, Pabna, and Tangail (1). In Mymensingh specifically, the average annual incidence rate between 1994 and 2004 was 5.8/10,000, and currently is as high as 300/10,000 in the most affected communities (1,2).

Post kala-azar dermal leishmaniasis, or PKDL, was first clinically described in Bengal by Brahmachari in 1922 (3). Diverse dermal lesions – from hypopigmented pinpoint marks, to erythematous papules, nodules, and

others – appear in individuals who are otherwise asymptomatic, usually months to years after the occurrence and apparent effective treatment of classic kala-azar (4). Affected persons, though clinically well, harbour the Leishmania parasite in their skin lesions; sandflies which take a bloodmeal may thus become infectious, making PKDL patients an important reservoir in anthroponotic leishmaniasis transmission.

Despite being long recognized clinically, research on the risk factors, epidemiology, and management of PKDL is quite limited, especially in South Asia. Anecdotally, the number of PKDL patients in certain kala-azar endemic pockets of Bangladesh is clearly on the rise, but actual statistics remain incomplete and are only just beginning to be officially collected. PKDL is essentially a clinical diagnosis, because dermatopathological sampling of patients is impractical, and there is a lack of definitive laboratory testing. Under current Bangladeshi national guidelines, patients with PKDL are treated with 120 intramuscular sodium antimony gluconate (SAG) injections, in 20/month cycles over 6 months.

Field experience with PKDL, Mymensingh

An active surveillance study exploring kala-azar, kala-azar treatment failure/relapse, and PKDL cases was commenced in the most affected upazilla of the country, Fulbaria, Mymensingh, in June of this year (2007). A field team selected communities with the highest rates of disease based on recent governmental data and administered surveys to individuals at their homes. Patients – current and from the past 5 years – were identified by symptom and treatment history oriented questionnaires, appropriate examination by physician, and rk39 (rapid, fingerprick blood) testing in the field. The study aims include a complete survey of 3 villages and a target sample population of more than 20,000 respondents. The data obtained will be compared with governmental passive surveillance statistics to assess rates of under-reporting. In addition, risk factor, laboratory, and further clinical characterization of especially current patients is being undertaken.

By November of 2007, interviewers have surveyed approximately 8,400 respondents with the completion of the study's primary field site of Chouder Village. From this population, a total of 32 current and 11 recent (treated and resolved within the last 5 years; one death during treatment) PKDL patients have been identified, and preliminary review of this emerging cohort has revealed several notable findings. While the village point prevalence for PKDL is 3.8/1,000 residents, one para (neighborhood), Nodipar demonstrated a rate nearly twice this, at 7.3/1,000 (Table 1). Also, rates of PKDL amongst treated kala-azar patients have been higher than expected in the entire community at 13.9% and reached 16% in 4 of 9 paras (Table 2).

Table 1: PKDL burden in Chouder Village, by highly affected paras and in total

Paras	Total population	PKDL patients		
		Past patients*	Current patients	Point prevalance (per 1,000 population)
Nodipar	821	0	6	7.3
Madhyopara	2,625	1	13	5.0
Laxhmipur	1,234	5**	4	3.2
Brahminbari	571	4	3	5.3
All - Chouder	8,397	11	32	3.8

*Onset within the past 5 years, treated and resolved, or died during treatment

**Includes one patient who died during treatment

Table 2: Kala-azar patients treated in the last 5 years and PKDL development

Paras	Kala-azar patients		
	Total*	Who have developed PKDL**	Proportion (%) of patients treated in the last 5 yrs. that developed PKDL
Nodipar	35	6	17.1
Madhyopara	72	13	18.1
Laxhmipur	19	3	15.8
Brahminbari	35	6	17.1
All - Chouder	231	32	13.9

*Onset within the past 5 years (includes current cases)

**PKDL patients who had kala-azar more than 5 years ago are captured as past and current PKDL patients in table 1 above, but are not included in these figures

Closer exploration of individual cases reveal important patterns regarding timing of PKDL related to kala-azar and patients' response to treatment. Based on respondents dating in the detailed surveys, presentation of PKDL lesions occurred within 2 years after kala-azar treatment in the majority (24/40) of patients, with 20% of patients within 6 months, and 40% between 6-24 months (Table 3). Also, of the 10 patients who experienced resolution of PKDL after treatment and from whom complete information

Table 3: PKDL presentation in relation to kala-azar treatment

PKDL presentation after kala-azar treatment	Number of patients (%)
0-6 months	8 (20)
>6-12 months	7 (18)
>12 months-24 months	9 (22)
>24 months-36 months	9 (22)
>36 months-48 months	7 (18)

was obtainable, 7 actually received less than the standard 120 day SAG regimen, secondary to extreme pain/injection intolerance, early and complete disappearance of lesions, or contemporaneous death or severe illness of co-patients receiving SAG (Table 4). Of note, these patients demonstrated similar timeframes of resolution to the 3 patients who received the full 6 month treatment course, with their lesions generally beginning to regress within 3-5 months of initiating treatment, and completely disappearing within 6-9 months.

Table 4: Treated and resolved PKDL patients

Case	Gender	Age	Total SAG injections	Reason for shortened therapy	Months after treatment initiation to beginning of lesion regression	Months after treatment initiation to complete PKDL resolution
1	Male	15	60	a	8	15-16
2	Male	26	60	b	5	7-8
3	Male	26	60	c	5	7-8
4	Female	20	120		3	5
5	Female	10	86	d	Unknown	5
6	Male	7	60	e	2	4
7	Female	6	60	f	2	9
8	Male	8	120		3	9
9	Female	17	120		1	5
10	Male	23	91	g	3	9

a= personally discontinued due to death of co-patient in hospital receiving SAG
b= severe illness (typhoid) occurred with completion of 3 SAG cycles
c= brother of Case #2, discontinued at same time
d= complete resolution of lesions; medical providers discontinued
e= near end of 3rd cycle of injections, debilitating pain, anorexia, fever, weakness
f = near end of 3rd cycle of injections, debilitating pain and weakness
g= during 4th cycle, progressive weakness, inability to eat

Additionally, three of the youngest patients presented with symptoms consistent with treatment-relapse kala-azar along with their PKDL lesions. A brief clinical description of one may be most illustrative: A 3.5 year-old female, whose father had kala-azar at the time of her birth, was first diagnosed with kala-azar at age 6 months after ongoing fever and poor growth. She improved after 20 continuous days of SAG injections as an inpatient at the Upazilla Health Complex Hospital, but again at age 1.5 (1 year later) presented with prolonged fever and marked anorexia. At that point, physicians at governmental facilities (based apparently on both clinical judgment and positive aldehyde (AT) testing) again felt that she had active kala-azar disease, and she was treated with 60 injections of SAG, in 20 injection/month cycles over 3 months. Approximately 2 months after the completion of this second regimen (21 months prior to our initial evaluation), she broke out with hypopigmented papules diffusely over both legs, and again experienced abdominal pain and suppressed appetite. At the time of our field examination and diagnosis, she appeared stunted and very ill, had conspicuous hypopigmented papules – confluent in areas – densely spread over her legs, arms, and mainly the cheeks of her face; she continued to have abdominal fullness with mild splenomegaly, regular fevers and debilitating anorexia, and had a recent history consistent with repeat respiratory and skin infections.

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Comment

Our growing experience with PKDL patients from Mymensingh challenges the existing understanding of the disease in Bangladesh, and suggests that PKDL is a more common and complex clinical phenomenon than currently assumed. South Asian PKDL is conventionally described as occurring in a limited proportion of treated kala-azar patients, who are otherwise asymptomatic, usually 2-3 years after classic kala-azar disease, and that spontaneous cure is never seen – making treatment mandatory (4). In con trast, initial evaluation of the study population in Fulbaria, Mymensingh reveals that a majority of patients' dermal lesions appeared within 2 years of resolution of KA, and in several individuals as early as within 6 months. Also, we have identified a few respondents whose PKDL lesions demonstrated rapid increase followed by steady improvement towards disappearance without any intervention, which raises the possibility that the disease may resolve on its own (without treatment). Considering the observations of the patients evaluated to date, PKDL appears to naturally evolve in distinct patterns and rates, varying significantly at the individual level.

In addition, a number of our PKDL patients described ongoing fevers,

while at least three also had re-appearance of anorexia and abdominal fullness, all classic kala-azar symptoms. These observations indicate that the emergence of PKDL consistent lesions is not always independent of other visceral leishmaniasis features, and may occur in patients who had ineffective management of their original kala-azar and thus a persistence of systemic symptoms, often known as treatment failure or relapse cases.

In sum, the appearance of PKDL consistent skin lesions may be more closely associated with classic kala-azar than initially assumed in South Asia, representing a manifestation within a spectrum of *Leishmania*-host/immunity interactions rather than a completely distinct clinical entity – a concept which has best been described in the framework of PKDL seen in Sudan (4).

These early observations also call into question the existing national PKDL treatment and disease control strategies. The current treatment regimen of 120 SAG injections is not only particularly lengthy and painful, but also risky: prolonged use of the drug increases the potential for serious cardiac side-effects as well as exposure to 'toxic' drug batches, which often appear on the market unexpectedly and may be discovered by the occurrence of multiple sudden fatalities within a short time (5). In fact, the unexplained and relatively sudden death of a 7-year old girl from Chouder in 2004, who was overall well and had completed 57 SAG injections in the midst of her PKDL treatment (as explained by several family members during a thorough verbal autopsy), raised strong concern for drug-related toxicity.

Additionally, this rigorous regimen is supported neither by comprehensive clinical trials in the literature, nor by the practices of other kala-azar endemic countries. For example, in neighbouring Bihar state in India where antimony-resistance is a major problem, SAG is rarely used for more than 3 months, and in East Africa, PKDL – when treated, is usually approached with short course, combination therapy, including more effective alternatives such as amphotericin or paromomycin. The experiences of our 7 patients who achieved resolution with shorter than standard treatment similarly suggest that the arduous 6 month SAG course is not always necessary for resolution.

Also, the experience from Chouder indicates that PKDL may occur in a notably higher percentage of treated kala-azar patients, and be more prevalent, then assumed. Though the determined point prevalence (of 3.8/1,000) for the entire village is slightly less than 4.8/1,000 – the figure reported from the only existing community based study, from an endemic area of Varanasi, India, published in 1989 – a third of Chouder's paras had rates higher than this of above 5.0/1,000 (5). Similarly, the proportion of our kala-azar patient cohort which has developed PKDL has been striking, with 14% in the entire community and 18% in two of the most affected

para, significantly greater than the conventional 5-10% repeated throughout the literature for South Asian patients. Our current calculations likely underestimate the true rates of PKDL emergence in treated kala-azar patients, because identified kala-azar patients from the past 5 years – particularly those with more recent illness – may present with characteristic dermal lesions any time in the future.

Preliminary assessment of any ongoing study, particularly when sample sizes remain small, is vulnerable to mis- or over-interpretation, and analysis of eventually completed data may not support initial observations. Additionally, disease rates and patient characteristics from the highest-endemicity region of Bangladesh may not ultimately reflect and be generalizable to less affected areas of the country or elsewhere.

Nevertheless, these early community based data from Mymensingh urge not only further research into PKDL but also a timely re-evaluation of current national control measures. Ideally, kala-azar patients should be followed regularly for development of PKDL consistent skin lesions, with enhanced community based identification. Likewise, research on PKDL's epidemiology and clinic features would be best approached with close longitudinal observation (rather than cross-sectional or retrospective analysis). Finally, along with active and early case detection, disease control efforts should include an immediate exploration of alternative kala-azar and PKDL treatment strategies, and associated measures such as targeted vector control, particularly in areas with a high-density of affected individuals.

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Consequences of early marriage on female schooling in rural Bangladesh

Marriage for women before age 18 is common in rural Bangladesh. This study aimed to assess the relationship between early marriage and duration of schooling for girls in rural Bangladesh. We obtained data from ongoing surveillance conducted by ICDDR,B in Abhoynagar. None of the sampled females who were married before age 18 attained 11 or more years of schooling, whereas, 23% of the females who married at age 25 or above completed 11 or more years of schooling. Women who married below age 19 were also less likely to work outside the home. These data suggest that delaying female marriage may increase female schooling attainment.

Bangladesh has one of the highest rates of child/adolescent marriage worldwide (1). In rural Bangladesh, parents encourage marriage of their daughters while they are still adolescents or children in hopes that this marriage will benefit them both financially and socially. Young girls are often regarded as an economic burden to their families; marrying them off at a very early age is seen as reducing the financial burden of the family (2). Parents encourage early marriage with a fear that their dowry price will increase as their daughter ages (3). It is also a way to ensure that their daughters are 'protected', as parents feel their daughters will be better off financially and safer from sexual abuse or illicit sexual contact than if they are married. Families with unmarried, older daughters are often stigmatized because they have not acted to 'protect' their family's honor by securing an early marriage.

Studies have demonstrated that girls who marry as adolescents attain lower schooling levels, have lower social status in their husband's families, report less reproductive control, and suffer higher rates of maternal mortality and domestic violence (3). Early marriage extends a woman's reproductive span, thereby contributing to large family size, especially in the absence of contraception. In addition, these individual outcomes suggest a number of larger social consequences, including higher population growth, higher rate of maternal mortality and a higher incidence of orphaned children (4). As a result of these patterns, early marriage is an issue of significant concern to policy makers and human rights advocates.

Social reformers in developing countries expressed their concern about early marriage early in the 2oth century (4). The right to free and full consent to marriage was recognized in the 1948 Universal Declaration of

Human Rights and many subsequent human rights instruments. Proponents of age of consent laws argue that forcing parents to delay marriage will increase female schooling attainment and reproductive control, and decrease incidence of domestic violence. More recently, safe motherhood advocates have emphasized that adolescent pregnancies from early marriages constitute a major risk to the survival and future health of both mother and child (4).

This analysis aimed assess the relationship between early marriage and duration of schooling for girls in rural Bangladesh.

This study used data from ICDDR,B's Abhoynagar Surveillance System, which has been in operation in five unions in this sub-district in south-western Bangladesh since 1982. The primary objective of this surveillance system is to monitor population change over time. Structured interviews, which collect data on fertility, mortality, migration, contraception, vaccinations, marriage, occupation and education of household members, are administered every three months from every fourth household covering 34,000 individuals and 7,500 households.

The sample for this study consisted of all females in Abhoynagar surveillance area who were married in 2005 and 2006.

Background characteristics of the respondents

The 564 females in Abhoynagar surveillance area who married during 2005 and 2006 were not highly educated (Table 1). Over two thirds of the sample (69%) had 6-10 years of schooling. Around a quarter (27%) obtained education up to 0-5 years. Only 4% of females attended school for more than 11 years.

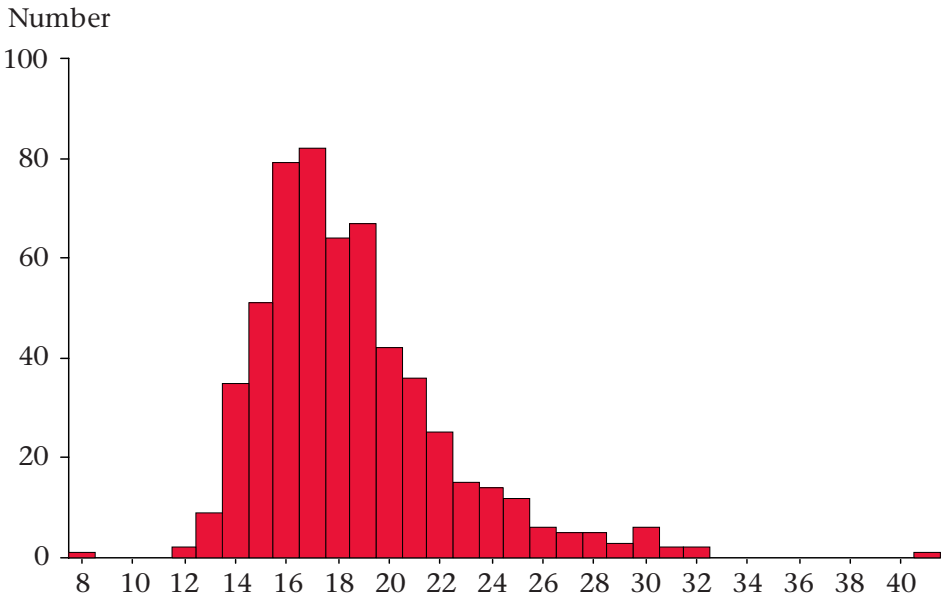
Seventeen percent of all of

Table 1: Socio-demomgraphic characteristics of girls who married in 2005 and 2006 in Abhoynagar

	N=564 n (%)
Education	
0-5 years	150 (27)
6-10 years	389 (69)
11 years and above	25 (4)
Age at marriage	
8-15 years	99 (17)
16-18 years	220 (39)
19-24 years	202 (36)
25 and above	43 (8)
Respondent works outside home	152 (27)
Education of respondent's mother	
no education	353 (63)
primary education	211 (37)
Education of respondent's father	
0-5 years	222 (39)
6-10 years	91 (16)
11 years and above	110 (20)
Unknown	141 (25)
Mother works outside home	82 (15)
Father works in agriculture	322 (57)

marriages in 2005 and 2006 were to girls under the age of 16 years including one child who was married at age eight. The median age of marriage was 18 years. Only 8% of marriages were to women 25 or more years of age (Figure 1).

Figure 1: Distribution of female's age at marriage, Abhoynagar, 2005-2006



The majority of married females did not participate in the labour force (Table 1). More than 60% of the mothers of these women had no education. None of the mothers had 11 or more years of education. Therefore, mothers were categorized only into two groups, mothers with no education and mothers with primary education. Thirty-nine percent of the fathers had ≤5 years of education. Twenty five percent of the fathers had informal education (categorized as 'unknown' in table 1). More than half of the fathers did not work outside the home.

Relation between early marriage and female schooling

Women who married at a younger age completed fewer years of formal education (Table 2). None of the females who married before age 19 years completed 11 or more years of education. On the contrary, 23% of the women who married at 25 or more years of age received at least 11 years of education. Seven percent of the women who were married between 19 and 24 years of age completed at least 11 years of schooling. Thirty nine

percent of girls who were married before 16 years of age completed <6 years of schooling, compared to only 14% among women who were married at over age 25 years.

We assessed whether the effect of age on educational achievement was independent of other factors associated with educational achievement including father's education, mother's education, and daughter's labour force participation using logistic regression. The median educational attainment in the study population was 8 years. We assessed risk factors for having <8 years of education using logistic regression. Age at marriage was a strong and independent predictor of educational attainment even when controlling for parental education and labor force participation (Table 3). Children married before age 15 were at increased risk of completing 8 or fewer years of education.

Not only education, but participation in labour force of the study population is also seen as key to female development (3). With this view, the relationship between early marriage and females' labour force participation was explored. Participation of women in labour force tends to be lower for those who had an early marriage. For exam-

Table 2: Relation between age at marriage and educational attainment of females, Abhoynagar 2005-2006

Age at marriage	Years of education		
	0-5 years	6-10 years	⊠11 years
8-15 (n=99)	39%	61%	0%
16-18 (n=220)	29%	71%	0%
19-24 (n=202)	20%	73%	7%
≥25 (n=43)	14%	63%	23%
All (N=564)	27%	69%	4%

Table 3: Logistic regression odds for educational attainment of females married in Abhoynagar in 2005 and 2006

	Risk for ⊠8 years of education Adjusted odds ratio (95% confidence interval)
Age at marriage	
8-15 years	28.0 (9.8-80)
16-18 years	4.6 (2.1-10)
19-24 years	1.3 (.59-2.9)
25 and above*	0.0
Labour force participation	
not in labour force	2.6 (1.6-4.1)
in labour force*	0.0
Education of mother	
no education	3.3 (2.1-5.1)
primary education*	0.0
Education of father	
0-5 years	2.4 (1.5-3.7)
>5 years*	0.0

*Comparison group

ple, 25% and 26% of the girls in the sample who married during age 8-15 and 16-18 years, participated in the labour force, compared to 47% of those who married at ≥25 years of age.

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Comment

Table 4: Relationship between early marriage and labour force participation of females married in Abhoynagar in 2005 and 2006

Age at marriage	In labour force n (%)
8-15 (n=99)	25 (25)
16-18 (n=220)	57 (26)
19-24 (n=202)	50 (25)
≥25 (n=42)	20 (47)
All (N=564)	152 (27)

In this rural community in Bangladesh 17% of all marriages are to girls who are under the age of 16 years. During the past decade, the movement for 'Education for All' has stressed the need to enrol more girls in school and to keep them from dropping out before completion of their education. In this context, the custom of early marriage is acknowledged as one of the reasons for girl's drop-out from school, especially, in cultural settings where girls are raised for a lifetime confined to household occupations and are expected to marry very young (5). Our analysis also shows, girls in rural Bangladesh who marry at very young ages attain less schooling. This study did not follow the girls after marriage in order to measure their final educational attainment, though other research suggests that rural Bangladeshi girls do not continue education after marriage (6). We also do not know whether or not girls were enrolled in school before they married. However, this analysis supports the idea that delaying female marriage may increase female schooling attainment.

According to the Child Marriage Restraint Act, the minimum legal age at marriage is 18 years for females in Bangladesh. Even partial enforcement of 18 as the minimum age at marriage in Bangladesh, could have a positive effect on schooling. In Bangladesh, prosecutions of lawbreakers, parents or spouses, is uncommon. One difficulty in application of the age of consent law is that in rural Bangladesh most marriages are unregistered (6). The situation is exacerbated by the fact that birth registration is so irregular that age at marriage may not be known. Laws should be enforced to discourage early marriage; however, legal actors alone are insufficient. Social programmes may also be effective in deterring early marriage.

Poverty is one of the most frequently cited factors behind child and adolescent marriage in rural Bangladesh. Therefore, programmes aimed at poverty alleviation can incorporate disincentives for families to marry

their daughters off at a young age. For example, a micro-finance programme in India excludes parents who marry off their daughters before age 19 (6). Such innovative strategies might also be effective for Bangladesh. All available tools should be used to create an environment where girls can wait until they are ready for marriage.

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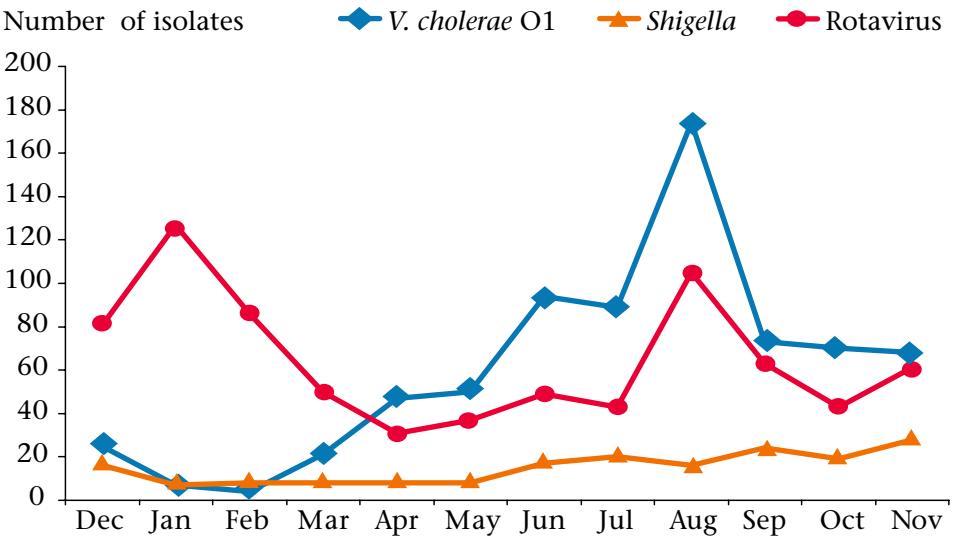
Surveillance update

With each issue of the HSB, updates of surveillance data described in earlier issues are provided. These updated tables and figures represent the most recent observation period available at the time of publication. We hope these updates will be helpful to health professionals who are interested in current patterns of disease and drug resistance.

Proportion of diarrhoeal pathogens susceptible to antimicrobial drugs: December 2006-November 2007

Antimicrobial agents	*Shigella* (n=179)	*V. cholerae* O1 (n=721)
Nalidixic acid	22.0	Not tested
Mecillinam	94.4	Not tested
Ampicillin	57.5	Not tested
TMP-SMX	33.5	0.0
Ciprofloxacin	96.6	100.0
Tetracycline	Not tested	48.8
Erythromycin	Not tested	10.5
Furazolidine	Not tested	0.0

Monthly isolation of V. cholerae *O1,* Shigella *and Rotavirus: December 2006-November 2007*



Antimicrobial resistance patterns of 114 M. tuberculosis *isolates: December 2006-July 2007*

Drugs	Resistance type		Total (n=114)
	Primary (n=106)	Acquired* (n=8)	
Streptomycin	25 (23.6)	2 (25.0)	27 (23.7)
Isoniazid (INH)	8 (7.5)	2 (25.0)	10 (8.8)
Ethambutal	2 (1.9)	2 (25.0)	4 (3.5)
Rifampicin	3 (2.8)	2 (25.0)	5 (4.4)
MDR (INH+Rifampicin)	2 (1.9)	2 (25.0)	4 (3.5)
Any drugs	26 (24.5)	2 (25.0)	28 (24.6)

() column percentage * Antituberculous drugs received for one month or more

Antimicrobial susceptibility pattern of S. pneumoniae *among children <5 years during July-September 2007*

Antimicrobial agents	Total tested (n)	Susceptible n (%)	Reduced susceptibility n (%)	Resistant n (%)
Ampicillin	11	11 (100.0)	0 (0.0)	0 (0.0)
Cotrimoxazole	11	2 (18.0)	0 (0.0)	9 (82.0)
Chloramphenicol	11	11 (100.0)	0 (0.0)	0 (0.0)
Ceftriaxone	11	11 (100.0)	0 (0.0)	0 (0.0)
Ciprofloxacin	11	10 (91.0)	1 (9.0)	0 (0.0)
Gentamicin	11	0 (0.0)	0 (0.0)	11 (100.0)
Oxacillin	11	11 (100.0)	0 (0.0)	0 (0.0)

Source: Children participating in PneumoADIP surveillance in Dhaka Medical College Hospital, Chittagong Medical College Hospital, Sir Salimullah Medical College and Mitfort Hospital, ICH-Shishu Sasthya Foundation, Chittagong Maa Shishu O General Hospital, Dhaka Shishu Hospital, Kumudini Hospital-Mirzapur, and ICDDR,B's urban surveillance in Kamalapur (Dhaka) and rural surveillance in Mirzapur (Tangail).

Antimicrobial susceptibility pattern of S. typhi *among children <5 years during July-September 2007*

Antimicrobial agents	Total tested (n)	Susceptible n (%)	Reduced susceptibility n (%)	Resistant n (%)
Ampicillin	79	39 (49.0)	0 (0.0)	40 (51.0)
Cotrimoxazole	79	43 (54.0)	0 (0.0)	36 (46.0)
Chloramphenicol	79	42 (53.0)	0 (0.0)	37 (47.0)
Ceftriaxone	79	79 (100.0)	0 (0.0)	0 (0.0)
Ciprofloxacin	79	52 (66.0)	26 (33.0)	1 (1.0)

Source: Children participating in PneumoADIP surveillance in Dhaka Medical College Hospital, Sir Salimullah Medical College and Mitfort Hospital. ICH- Shishu Sasthya Foundation, Chittagong Maa Shishu O General Hospital, Dhaka Shishu Hospital and Kumudini Hospital, Mirzapur

Young PKDL patient from Mymensingh with typical hypopigmented papules and plaques on face

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