



Interrupting pathways to sepsis: Effectiveness of an intervention to reduce delays in timely care for sick children in rural Bangladesh



Frances E. Aboud^{a,*}, Ehsanur Rahman^b, Rosemin Kassam^c, Jasmin Khan^b, Nabeel Ashraf Ali^b, Fahmida Taleb^b

^a Department of Psychology, McGill University, Canada

^b International Centre for Diarrheal Disease Research, Bangladesh

^c School of Population and Public Health, University of British Columbia, Canada

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ABSTRACT

Rationale: The time it takes for a child with suspected sepsis to receive care is critical.

Objective: We evaluated care-seeking practices for sick children under 5 years in rural Bangladesh, following interpersonal communication to inform households of newly introduced supports for quality care. Based on the Delays Framework, we assessed length and source of care-seeking delays, use of formal providers, and autonomous decision-making among mothers.

Method: Using two cross-sectional rounds before and after the 3-year intervention (August 2012 and August 2015), we surveyed 400 mothers of recently sick children in 26 randomly sampled villages from 2 intervention and 2 control subdistricts, using structured questions about delays. Six to ten times during the 18-month intervention period, local workers communicated four key messages to most intervention households in 292 villages: serious symptoms of suspected sepsis in children, a call-in center number for referral advice, a reliable transport hub, and upgrades to the local hospital.

Results: Compared to baseline, endline results demonstrated a significant difference in the total delay between the onset of child's illness and seeking external care, with intervention families having shorter delays. Over 90% of mothers informed someone in the family, mainly the husband, about the sick child before acting to seek care. Delays due to transportation and receiving provider care were short and not different. Using a benchmark of seeking external care within 24 h of onset, only 14.14% of intervention households and 13.40% of control households were "timely" in seeking care. Approximately 78% of parents, similar for the two groups, sought care from a non-formal practitioner (the village doctor).

Conclusion: The results demonstrate that the delay in deciding to seek external care is most serious, and that communication strategies at the community level are necessary to increase the uptake of improved health services.

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Although the number of child deaths has declined by half since 1990, 6.3 million children under 5 years continue to die from preventable diseases worldwide (Liu et al., 2015). South Asian countries account for approximately one-third of the deaths overall, with half being caused by sepsis (Kissoon et al., 2011). Sepsis is defined as a systemic inflammatory response in the presence of an infection. It can result from any infection and is characterized by an immune system break down, followed by multiple organ failure

and eventual death (Kissoon et al., 2011). Timely, quality care is recognized as essential because many infections can quickly lead to sepsis, and every hour's delay in treatment leads to an 8% increased risk of death (Kumar et al., 2006). Sepsis has been targeted in programs aimed at safe delivery in low- and middle-income countries, but less so in under-five children (Campbell and Graham, 2006; Liu et al., 2015). Consequently, this study evaluated care-seeking among parents of sick children under 5 years, following implementation of an intervention aimed at improving practices in the community and the health care system.

Timely and quality care for young children with infection continues to be a problem in Bangladesh and elsewhere (Sreeramareddy et al., 2015). A number of programs in Bangladesh

* Corresponding author. Department of Psychology, 1205 Dr Penfield Ave, Montreal, Canada.

E-mail address: frances.aboud@mcgill.ca (F.E. Aboud).

have addressed the quality of care provided at health facilities by improving health worker skills in diagnosis, treatment and referral, and improving access to essential medicines (Arifeen et al., 2009; Baqui et al., 2008; Chowdhury et al., 2008). However, common findings in the IMCI 12-country evaluation are that health facilities are infrequently used (Arifeen et al., 2009; Bryce et al., 2005).

Treatment of sepsis requires the diagnostic and procedural capabilities of a hospital. Consequently, it was important to go beyond the improvement of facilities with a community-based communication strategy to inform parents about supports for timely care. Communicated messages were designed to inform families about nearby hospital upgrades, convenient referral services, and reliable transport. The research questions concerned when and why delays occurred in seeking treatment.

Our conceptual framework for studying timely and appropriate care-seeking for a sick child was a modified version of the Three-Delays Framework for maternal mortality (Thaddeus and Maine, 1994). The argument is that delays in care-seeking lead to death, so it is important to identify where in the care-seeking process delays occur and why. When applied to Bangladesh, Koenig et al. (2007) found that 61% of women recognized the seriousness of their condition within 6 h, yet only 20% of these women sought treatment outside the home. Delays in travelling to outside care (transportation) and in receiving care once at the facility were minimal in comparison to delays in deciding to seek external care.

Thus, in Bangladesh, there appear to be four delays worth examining separately with respect to seeking care for a sick child: (1) the time taken from the onset of the illness to recognizing a serious symptom, (2) the time to arrive at a decision to seek outside care, (3) time to reach the provider, and (4) time to receive care from that provider. The Three-Delays Framework generally combines 1 and 2, but we separated them here because of literature attesting to the lack of decision-making autonomy of young mothers in South Asia, thus lengthening Delay 2 (e.g., Mohan et al., 2008; Pillai et al., 2003). The larger project addressed these delays through supports to reduce them and a community-based communication strategy to inform families.

The overall hypothesis was that delays in care-seeking for a sick child would be lower at endline in intervention households than control households. We expected delays in making the decision to seek outside care would be the lengthiest due to the need to include family members. We expected that seeking care from a formal provider would be higher in the intervention group as a result of overcoming cost and transport barriers.

1. Method

The reporting of this cluster nonrandomized trial follows the Transparent Reporting of Evaluations with Nonrandomized Designs (TREND) guidelines.

1.1. Design and participants

The study used an intervention-control design with two rounds of cross-sectional surveys, one at baseline and one at endline. Two subdistricts (*upazilas*) in the district of Tangail were non-randomly assigned to receive the intervention that intended to facilitate timely care or the control that was care as usual. None of the 4 subdistricts was at the time covered by other programs. Participants targeted by the intervention were all households in the two intervention subdistricts, population approximately 500,000, with either a child under 5 years of age or a pregnant woman.

Respondents to the surveys were a specific subset of those exposed to the intervention, namely mothers who had a recently sick child under 5 years. Consequently, respondents were different

at the baseline (August 2012) and the endline (August 2015). Caregivers, usually mothers, were recruited after an initial home screening to identify households where a recently sick child under 5 years resided. Inclusion criteria were: residence in one of the sampled villages and having a child under 5 years of age who was sick in the past week. Mothers signed the consent form to participate in the survey. Ethics approval was obtained from the University of British Columbia, McGill University, and the International Centre for Diarrheal Disease Research, Bangladesh.

1.2. Randomization and masking

Four contiguous subdistricts in Tangail, with similar distances from the city of Tangail, were non-randomly assigned to receive the intervention (Bhuapur and Gopalpur) or care as usual (Kalihati and Ghatal). Subdistricts, rather than villages, constituted the unit of assignment to maintain the administrative structures of the health systems, to match as closely as possible the terrain and demographics of intervention and control sites, and to minimize contamination. The two intervention subdistricts together had 13 unions with approximately 292 villages. Twenty-six villages, one from each of the 13 unions in both the intervention and control subdistricts, were randomly selected for data collection. The same 26 villages (clusters) were sources of data before and after the intervention though respondents were not the same at these two time points, as age and illness eligibility requirements likely excluded baseline respondents.

Neither households nor delivery agents (communicators) were blind to their condition. To keep the intervention assignment hidden from data collectors, we ensured they did not interact with those who implemented the intervention. Baseline data were collected before any implementation work had started; new research assistants were trained to collect data at the endline. Survey questions concerning exposure to the intervention messages were placed at the end of the survey. Nonetheless, research assistants may have become aware of the status of the village after interviewing several respondents.

1.3. Intervention, delivery and monitoring

There were several intervention components: 1. Households were visited on a monthly basis to communicate the danger signs of sepsis and new supports for seeking timely care; 2. A call-in center was available for parents who wanted to know if their sick child needed hospital care; 3. An inexpensive transport system using local rickshaws was coordinated; 4. Two local subdistrict hospitals were upgraded with a protocol for emergency triage, assessment and treatment of syndromic sepsis. The communication component was initiated in January 2014 when most of the service components were starting to take shape. It became fully functioning across all intervention villages by April 2014, and stopped after 18 months in June 2015 ahead of the endline survey.

The following key messages addressed what were known to be serious barriers to timely care based on focus group discussions, the baseline survey findings, and past research in Bangladesh:

1. There are several danger signs of sepsis that are very serious and need to be treated immediately. If you see these danger signs call the Call-in Centre or go to the health facility.
2. Call the Call-in Centre (number XXX) for advice on the seriousness of the symptoms and if care from the health facility is needed.
3. The call-in centre can organize Emergency Transportation from a pick-up point to the health facility. This transportation is reliable and prices are fixed.

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