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Village health workers in Bihar, India: an untapped resource in the struggle against kala-azar

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Abstract

INTRODUCTION In 2005 a visceral leishmaniasis (VL) elimination initiative was launched on the Indian subcontinent; important components of early case finding and treatment are entrusted to the primary health care system (PHC). In an earlier study in Bihar, India, we discovered some major shortcomings in implementation, in particular related to monitoring of treatment and treatment outcomes. These shortcomings could be addressed through involvement of village health workers. In the current study we assessed knowledge, attitude and practice of these village health workers in relation to VL. Main objective was to assess the feasibility of their involvement in VL control.

METHODS We obtained a list of auxiliary nurses/midwives and accredited social health activists for the highly endemic district of Muzaffarpur. We randomly sampled 100 auxiliary nurses and 100 activists, who were visited in their homes for an interview. Questions were asked on knowledge, attitude and practice related to visceral leishmaniasis and to tuberculosis.

RESULTS Auxiliary nurses and activists know the presenting symptoms of visceral leishmaniasis, they know how it is diagnosed but they are not aware of the recommended first-line treatment. Many are already involved in tuberculosis control and are very well aware of the treatment modalities of tuberculosis, but few are involved in control of visceral leishmaniasis control. They are well organised, have strong links to the primary healthcare system and are ready to get more involved in visceral leishmaniasis control.

CONCLUSION To ensure adequate monitoring of visceral leishmaniasis treatment and treatment outcomes, the control programme urgently needs to consider involving auxiliary nurses and activists.

keywords KAP survey, visceral leishmaniasis, tuberculosis, drug monitoring, drug effectiveness, public health system, supervised treatment, patient follow-up, auxiliary nurse/midwife, Accredited Social Health Activist network

Introduction

Visceral Leishmaniasis (VL), also known as kala-azar on the Indian Subcontinent, is a chronic infectious disease transmitted by a phlebotomine sandfly. Worldwide, the annual incidence is estimated at 200 000–400 000. About 72% of cases are from India, the vast majority from the state of Bihar (Alvar *et al.* 2012). Muzaffarpur district of Bihar State is highly endemic for VL, although there is in all probability gross under reporting. In 2010, 2551 cases were notified in the district, equivalent to a case notification rate of 52.3/100 000. The disease has a clustered distribution and incidence varies widely between the 14 blocks that make up the district (Malaviya *et al.* 2011). VL patients are diagnosed at the community health centre level (Block PHC) based on a combination of a typical history (fever lasting more than 2 weeks and not responding to antimalarial treatment) and a positive rk39 rapid test. Treatment is provided free of charge from the same health centres. The first-line treatment is 28 days of oral Miltefosine, which has replaced the previous regimen of intramuscular sodium stibogluconate (SSG) (World Health Organization 2005).

In an earlier study on management of VL patients in Muzaffarpur district, we identified some important shortcomings in the VL control programme (Hasker *et al.* 2010). Referral mechanisms between village health workers and higher echelons of the system appeared to be defunct. As a result, patients often incurred substantial

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diagnostic delays within the public healthcare system. Many patients were still treated with SSG, and treatment was usually administered in the village by unqualified providers. Following the guidelines, a 6-month post-treatment follow-up is required for each patient, but the programme had no provisions for this. As a result, a substantial number of patients failed on treatment or relapsed without being notified thereof. Most of these patients had continued treatment elsewhere without the initial provider being aware.

India has a well-developed network of village health workers rooted in the PHC system. The rural PHC system has three levels of health facilities: at block level (the Indian equivalent of the district), there is a community health centre, which supports four primary health centres and 24 subcentres. Subcentres are run by midlevel health workers, referred to as auxiliary nurse/midwife (ANM). ANMs constitute the lowest level of salaried health workers in the system (Hasker *et al.* 2010). At village level, there are female volunteer health workers called 'Accredited Social Health Activist' (ASHA), each catering for a population of approximately 1000. ASHAs are deployed in their own villages, after a short training on community health. They are preferably between 25 and 45 years old and should have at least 8 years of formal education (Major stakeholders and their role, NRHM). ASHAs do not receive a salary, but they do receive fixed amount incentives for performing certain tasks. Their responsibilities range from providing health education to diagnosis of certain health conditions such as malaria and pregnancy (Gopalan *et al.* 2012). ASHAs are supervised by ANMs. Both ASHAs and ANMs regularly attend coordination meetings at the community health centre, ASHAs once a month, ANMS twice a month. The tuberculosis (TB) control programme already involves ANMs and ASHAs in identification and referral of TB suspects, as well as monitoring of treatment (Revised National TB Control Programme 2011).

Involving AMNs and ASHAs in VL control could be an effective way to overcome some of the problems in the management of VL cases that became apparent in the earlier study (Hasker *et al.* 2010). They could identify and refer suspects, supervise treatment and perform follow-up visits. Before making any definite recommendations, we assessed the current level of knowledge of ASHAs and ANMs related to VL, their current involvement and their experiences with VL, and their preparedness for further involvement. Thus, we conducted a KAP survey among ANMs and ASHAs in Muzaffarpur district. As the TB control programme already involves ASHAs and ANMs, questions on TB were included to enable us to contrast the responses to those on VL.

Materials and methods

The study was designed as a quantitative cross-sectional survey based on structured interviews with a group of 100 ASHAs and 100 ANMs. Study subjects were randomly sampled from a list of 843 ANMs and 3281 ASHAs from the 16 rural VL endemic blocks of Muzaffarpur district, provided by the district health authorities. Respondents were visited in their homes for the interviews.

The sample size was calculated in such a way that proportions of 50% can be estimated with a precision of $\pm$ 10% at a confidence level of 0.05; for any other proportion, the precision would be better. This required a sample size of 96. To account for the fact that some ASHAs/ANMs might be absent or not agree to cooperate, we sampled 100 ASHAs and 100 ANMs.

Interviews were conducted by social scientists with previous experience in VL. The structured questionnaire contained questions exploring training level, professional experience and experience with VL and TB; in addition, there were questions exploring knowledge on presenting signs and symptoms, mode of transmission and diagnostic and treatment procedures of VL and TB, as well as questions exploring willingness to become further involved in VL control.

The data was entered in an MS Access database, using a double data entry procedure, prior to which all personal identifiers were removed. Data analysis was performed using Stata/IC V10.1 (Stata Corp., College Station, TX, USA). Proportions and confidence intervals at 95% (CI 95) were calculated for individual items.

Ethical approval

This study was formally reviewed and approved by the Institutional Review Board of the Institute of Tropical Medicine (ITM), Antwerp and by the ethics committee of Banaras Hindu University in Varanasi, India. All participants were asked for informed consent prior to enrolment in the study.

Results

We were able to interview all 100 ANMs and 100 ASHAs sampled, all respondents were women. On average, ASHAs were younger (median age 32 years; Interquartile range [IQR] 29–36 years) than ANMs (median age 43 years; IQR 39–48 years). Almost all ANMs (97%) and 73% of ASHAs had education of higher secondary schooling or more. ANMs were very experienced with a median working experience of 19 years (IQR

5–24 years); ASHAs were usually less experienced but still had a median working experience of 6 years (IQR 5–7 years). The median weekly time spent on the job was 36 h for ANMs (IQR 30–42 h) and 14 h for ASHAs (IQR 10–21 h). The median number of visits to the PHC centre per month reported was 5 for both ANMs (IQR 4–7 visits) and ASHAs (IQR 3–8 visits). 98% of ANMs (CI95 93–100%) and 92% of ASHAs (CI95 85–96%) have a mobile phone, almost all in good working order.

Ninety two percent of ANMs (CI95 85–96%) and 77% (CI95 68–85%) of ASHAs interviewed had previously attended trainings on TB; for VL only 39% (CI95 29–49%) of ANMs and 26% (CI95 17–36%) of ASHAs had ever attended specific trainings. Ninety percent of ANMs (CI95 82–95%) and 82% of ASHAs (CI95 73–89%) have had at least one TB patient in their catchment area over the past 5 years; while 40% (CI95 30–50%) of AMNs and 24% (CI95 16–34%) of ASHAs reported having had at least one case of VL in their catchment area over the same period. When asked about their own involvement in TB and VL case finding and treatment, 89% of ANMs (CI95 81–94%) and 81% of ASHAs (CI95 72–88%) indicated ever having referred a TB suspect, in almost all cases (99%), such patients were referred to a health centre. For VL, 48% of ANMs (CI95 38–59%) and 23% of ASHAs (CI95 15–31%) had ever referred a suspect case, usually (92%) to a health centre. Fifty percent of ANMs (CI95 40–60%) and 27% of ASHAs (CI95 19–37%) were currently involved in TB treatment; for VL, 4% of ANMs (CI95 1–10%) and 2% (CI95 0–7%) of ASHAs were currently involved in treatment. Among ASHAs and ANMs involved in TB treatment, the most common tasks performed were daily observation of treatment (DOT), reported by 61%, and collecting TB drugs from the health centre, reported by 69%. None of the ANMs and only 16% of ASHAs reported ever having received incentives for their involvement in TB treatment; the incentive received in all cases was 200–250 Indian Rupees (equivalent to 4–5 US$). More details on specific trainings, experience and knowledge of ANMs and ASHAs are provided in Table 1.

Presenting signs of TB were well known; 99% (CI95 95–100%) of ANMs and 98% of ASHAs (CI95 93–100%) spontaneously mentioned cough, with or without haemoptysis, while fever was reported by 97% (CI95 91–99%) of ANMs and 86% (CI95 80–94%) of ASHAs. For VL, fever was mentioned by 99% of ANMs (CI95 95–100%) and 94% (CI95 87–98%) of ASHAs; other symptoms mentioned were loss of appetite/weight loss (74% (CI95 64–82%) of ANMs and 53% (CI95 43–63%) of ASHAs), enlarged spleen/swelling of abdomen (37% (CI95 28–47%) of ANMs and 9% (CI95 4–16%) of ASHAs) and blackening of the skin (33% (CI95 24–43%) of ANMs and 14% (CI95 8–22%) of ASHAs). Five per cent of ASHAs and none of the ANMs reported not knowing any symptoms of VL.

Most ANMs (93% CI95 86–97%) and ASHAs (91% CI95 84–96%) mentioned sputum smear microscopy as diagnostic test for TB; X-ray was mentioned by 74% (CI95 64–82%) and 71% (CI95 61–80%) of ANMs and ASHAs, respectively. A substantial proportion (29% (CI95 20–39%) of ANMs and 47% (CI95 37–57%) of ASHAs) mentioned a 'blood test'. For VL, 16% of ANMs (CI95 9–25%) and 30% (CI95 21–40%) of ASHAs did not know which diagnostic tests are used. Rapid tests or blood tests were mentioned by 70% (CI95 60–79%) of ANMs and 67% (CI95 57–76%) of ASHAs; 34% of ANMs (CI95 25–44%) and 10% (CI95 5–18%) of ASHAs mentioned gland, bone marrow or spleen aspiration.

The mode of transmission of TB was also well known, 98% of ANMs and 96% of ASHAs mentioned airborne transmission through coughing; for VL, on the contrary, there were some misconceptions. 77% of ANMS and only 52% of ASHAs correctly replied that the disease is transmitted by an insect; a substantial proportion of ANMs (26%) and ASHAs (30%) think the disease is transmitted through dirt.

When asked about treatment of TB, 20 ANMs (20%) and only 1 of the ASHAs (1%) were able to mention at least one of the generic names of the first-line drugs. Eighty ANMs (80%) and 34 ASHAs (34%) mentioned 'Category', referring to the WHO system classifying TB treatment as category 1, 2 or 3. Duration of standard TB treatment was well known with 92% of ANMs and 80% of ASHAs correctly replying: '6 months'. For VL treatment, the situation is different. The generic names of drugs are better known with 62% (CI95 52–72%) of ANMs and 9% (CI95 4–16%) of ASHAs able to mention at least one of the drugs commonly used by its generic name, but the drug most often mentioned was SSG (57% of ANMs and 5% of ASHAs); only 13% of ANMs and 1% of ASHAs spontaneously mentioned Miltefosine. When shown the list of drugs currently used in VL treatment and asked which of these drugs is currently the recommended first-line regimen, only 8% of ANMs and 1% of ASHAs correctly replied: 'Miltefosine'.

Almost all participants (99% of ANMs and 97% of ASHAs) were aware that free VL treatment is available at community health centres (Block PHC). Having been told that Miltefosine is the first-line treatment and asked how it is administered, 32% of ANMs and 12% of ASHAs correctly replied that Miltefosine is administered

Table 1 Training, experience and knowledge of ANMs and ASHAs related to TB and VL

	Tuberculosis		Visceral leishmaniasis	
	ANM	ASHA		
	% (95% CI)		ANM	ASHA
Attended training	92 (85–96)	77 (68–85)	39 (29–49)	26 (17–36)
Ever referred a suspect case	89 (81–94)	81 (72–88)	48 (38–59)	23 (15–31)
Case(s) in catchment area in past 5 years	90 (82–95)	82 (73–89)	40 (30–50)	24 (16–34)
Currently involved in treatment	50 (40–60)	27 (19–37)	4 (1–10)	2 (0–7)
Key presenting symptoms mentioned				
None	0 (0–4)	1 (0–5)	0 (0–4)	5 (2–11)
Cough	99 (95–100)	98 (93–100)	2 (0–7)	1 (0–5)
Fever	97 (91–99)	88 (80–94)	99 (95–100)	94 (87–98)
Weight loss	69 (59–78)	56 (46–66)	74 (64–82)	53 (43–63)
Abdominal distension (VL only)	NA	NA	37 (28–47)	9 (4–16)
Blackening of skin (VL only)	NA	NA	33 (24–43)	14 (8–22)
Mode of transmission mentioned				
None	0 (0–4)	2 (0–7)	4 (1–10)	17 (10–26)
Airborne	98 (93–100)	96 (90–100)	0 (0–4)	2 (0–7)
Foodborne	18 (11–27)	18 (11–27)	0 (0–4)	2 (0–7)
By insect (vectorborne)	2 (0–7)	5 (1–11)	77 (68–85)	52 (42–62)
Through dirt	9 (4–16)	13 (7–21)	26 (18–36)	30 (21–40)
Key diagnostic tests/procedures mentioned				
None	2 (0–7)	1 (0–5)	16 (9–25)	30 (21–40)
Sputum smear examination (TB only)	93 (86–97)	91 (84–96)	NA	NA
X-ray (TB only)	74 (64–82)	71 (61–80)	NA	NA
Sputum culture (TB only)	4 (1–10)	2 (0–7)	NA	NA
'Blood test', rapid test	29 (20–39)	47 (37–57)	70 (60–79)	67 (57–76)
Bone marrow, gland or spleen aspirate (VL only)	NA	NA	34 (25–44)	10 (5–18)
Knowledge on treatment				
Mentions generic name one or more 1st line drugs	20 (13–29)	1 (0–5)	62 (52–72)	9 (4–16)
Knows name of recommended 1st line regimen*	80 (71–87)	34 (25–44)	8 (4–15)	1 (0–5)
Knows mode of administration 1st line regimen	96 (90–99)	76 (66–84)	32 (23–42)	12 (6–20)
Knows duration of treatment 1st line regimen	92 (85–96)	80 (71–87)	10 (5–18)	1 (0–5)
Knows where treatment is available	100 (97–100)	97 (91–99)	99 (95–100)	97 (91–99)

*'Category', referring to category 1–3 in the WHO system is considered a correct answer.

orally; knowledge about the duration of treatment with Miltefosine was very poor, with 10% of ANMS and only 1% of ASHAs replying correctly.

Knowledge on VL was not much better among those who reported having participated in VL-specific training courses. Four of 39 ANMs (10%) and none of 26 ASHAs who had been trained knew that Miltefosine is the drug of choice. When asked about the duration of treatment with Miltefosine, 5 of the 39 ANMs (13%) and none of the 26 ASHAs replied correctly.

When asked whether they were prepared to get (more) involved in management of VL patients, 90% of ANMs and 97% of ASHAs responded positively. Eighty-five per cent of ANMs and 95% of ASHAs were prepared to visit VL patients at least on a weekly basis; 95% of ASHAs were prepared to collect drugs for VL patients from the PHC centre. So far, only 1 ASHA and none of the ANMs reported ever having received an incentive for involvement in VL care. If they would become more involved, 41% of ANMs and 98% of ASHAs would expect to be paid some incentive. In almost all cases, this was a monetary incentive. The maximum amount mentioned was 1000 Indian Rupees[1], for ANMs as well as for ASHAs; among those who responded the median amount expected was 500 Rupees for both categories (ANMs $n = 34$, IQR 400–600 INR; ASHAs $n = 91$, IQR 500–1000 INR).

Discussion

We were able to locate and interview all 200 respondents randomly sampled from the lists of 843 ANMs

[1]Exchange rate 56.9 Indian rupee for 1 US dollar.

and 3281 ASHAs provided by the district health authorities. All respondents, ANMS and ASHAs alike, regularly visited the community health centre (Block PHC) with a median of five visits per month. ASHAs are volunteers but nevertheless at the time of the interviews, they reported a median experience of 6 years on the job (IQR 5–7 years); this is indicative of a good retention among this cadre of health workers. Our study thus confirms that India does have a well-established network of village health workers with solid links to the primary healthcare system.

ANMs and ASHAs know very well the presenting symptoms of VL, most of them also know the mode of transmission and the main diagnostic tools used. The same applies to their knowledge on presenting symptoms, mode of transmission and diagnosis of TB. Where treatment is concerned, the situation is different. Drugs used to treat VL are apparently well known, at least among the ANMs. When asked about drugs used to treat TB, very few respondents knew any of the generic names, but the mode of administering treatment and the duration of the recommended first-line regimen are very well known. Although 62% of ANMs were able to mention some of the drugs used in VL treatment, only 8% knew that Miltefosine is the recommended first-line treatment in the PHC system in Bihar. One-third of ANMs knew that Miltefosine is an oral drug but only 10% knew the duration of treatment. There was not much difference in the replies among those that had and those that had not undergone specific VL trainings. Most of these trainings were 1 day during the monthly coordination meetings, without any systematic further involvement in the VL control programme.

These findings reflect the fact that the tuberculosis control programme does systematically involve ANMs and ASHAs and that this is so far not the case for the VL control programme. Yet, in both diseases, it is essential to ensure adequate intake of drugs and monitoring of treatment outcomes for which ASHAs and ANMs can be a powerful resource (Veen *et al.* 1998; Chakravarty & Sundar 2010). As we observed in an earlier study in this region, 28% of VL patients started on treatment were not cured by the treatment prescribed without the health services staff involved being aware of the problem (Hasker *et al.* 2010). Miltefosine is known to have a long half-life and to be susceptible to develop resistance with a single point mutation (van Griensven & Boelaert 2011). Uncontrolled use of the drug could have dire consequences for the VL control effort in the region. As has been known for several decades in TB control, a large-scale treatment programme needs to monitor not just the numbers of cases put on treatment but also the compliance with treatment regimens prescribed and the treatment outcomes (Styblo 1976).

In VL control, the ANMs and ASHAs provide a so far largely untapped resource that can make a major contribution. According to the guidelines Miltefosine treatment should be provided under supervision of a health worker or of a designated community member, and the patient will be encouraged to report to the treatment centre twice a week during treatment, so far this is hardly ever performed (Guidelines on use of Miltefosine). The vast majority of ANMs (85%) and ASHAs (95%) are prepared to pay weekly visits to patients on VL treatment; a follow-up visit 6 months after treatment completion could easily be included. They all visit the Block PHC centre on a very regular basis, on average at least once a week. This provides an easy opportunity to hand over treatment and to report back on results. Moreover, over 90% can be reached by mobile phone, further reducing any potential communication barriers. The standard catchment population for ASHAs is 1000, the estimated annual VL incidence in the endemic districts of India is 30/10 000 (Mondal *et al.* 2009). Thus, the average number of cases per ASHA would be about 3 per year, which is feasible.

Regular visits to patients on treatment can also be an opportunity for active case finding among close contacts of these patients because we know that VL has a strongly clustered distribution and that there is major under reporting (Hirve *et al.* 2010). Early diagnosis is now operationally feasible with the use of field-based rapid diagnostic tests (rK39) to detect antibodies to recombinant antigen rK39 (Cunningham *et al.* 2012). Such active case finding could also include post-kala-azar dermal leishmaniasis (PKDL), which is a condition for which patients often do not seek treatment spontaneously but which may be of importance in maintaining the transmission cycle of VL (Mondal *et al.* 2010). The ASHAs, who are volunteer workers, do expect to be paid some incentive, but the amounts mentioned were certainly not exorbitant. Moreover, an earlier study in the same region showed that paying incentives to ASHAs worked well in increasing early case detection of VL (Singh *et al.* 2011).

Conclusion

The VL control programme should urgently consider putting in place a strong system to monitor short- and long-term treatment outcomes, as is already performed for TB. ANMs and ASHAs can make an important contribution to such system by ensuring adequate intake of treatment and reporting of treatment outcomes among patients under their care. They are well organised, have

strong links to the PHC system and are prepared to get involved. The VL control programme should seize this opportunity to ensure successful control of VL in the longer term.

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