Original Article

Knowledge, attitude and practice of health workers towards leprosy at a high burden rural site in Ethiopia

Tsehaynesh Lema[1, 2*], Kidist Bobosha[2], Yonas Bekele[4], Edessa Negera[3], Addis Mengiste [2], Tsegaye Hailu[2], Samuel Ayele[2], Tadeye Abeje[2], Lawrence Yamuah[5], Abraham Aseffa [2] and Yimtubezenash Woldeamanuel[1]

[1]Addis Ababa University, College of Health Science, P.O. box 9086; Addis Ababa, Ethiopia
[2]Armauer Hansen Research Institute (AHRI), P.O. box.1005, Addis Ababa, Ethiopia
[3]London School of Hygiene and Tropical Medicine, Keppel Street, WC1E 7HT, London, UK
[4]Vaccine Branch, Center for Cancer Research, National Cancer Institute, National Institutes of Health, Bethesda, MD, United States of America
[5]Senior Clinical Research Associate, Niche Science & Technology Ltd, London, England, United Kingdom

Corresponding author*: rbpt21@yahoo.com

Abstract

Background: *Leprosy is a chronic mycobacterial disease of public health importance. The role of the health workers in leprosy diagnosis and management of leprosy is crucial. Hence, in this study, the knowledge, attitude and practice of the health workers was assessed at one of the leprosy high burden pocket areas (Kokosa) in the Oromia Regional State.*

Methods: *A cross-sectional study was conducted at Kokosa public health centers at 7 health facilities and 86 health workers included.. Upon informed consent, data were collected from health workers through a self-administered structured questionnaire in July 25-26, 2015. On-site observation was used to assess individuals and group performance. Bloom's cut off point was used to describe the knowledge and practical skills whereas Likert's scale was used to describe the attitude of the respondents.*

Results: *Data obtained from 86 health workers were included to the final analysis of knowledge and attitude. Among the participants, 72.1% of the health workers had poor knowledge of leprosy. A quarter of respondents (25.6%) had unfavorable attitude towards leprosy. Among 62 health workers assessed for practical skills, only 4 (6.5 %) diagnosed leprosy correctly. Forty percent of the health workers had less than 4 years of service whereas 48% of them had 5-14 years of service.*

Conclusion: *Leprosy tailored training program should be implemented to improve knowledge and skills of health workers on leprosy diagnosis and treatment.*

Key words: *Leprosy, Knowledge, Attitude and Practice, Health workers, Ethiopia*

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BACKGROUND

Leprosy is a chronic infectious disease caused by *Mycobacterium leprae*. It affects the skin, nerves and mucosa of the upper respiratory tract (1). With the introduction of multidrug therapy (MDT) , the prevalence of leprosy decreased globally (2). Ethiopia is one of the 23 countries identified as "global priority countries" for leprosy reporting > 1000 cases annually and ranked 1st in Africa in 2019 (3).In the Ethiopian health care system, leprosy care was a vertical program until 2001managed by leprosy specialized personnel at leprosy specialized hospitals.

The leprosy control program was fully integrated into the General Health Service (GHS) by the end of 2001 to ensure early patient diagnosis and deliver MDT to prevent disability (4). However, this integration meant patients were seen by general health workers during outpatient visits rather than by leprosy specialized personnel in leprosy dedicated clinics, exposing patients to the risk of misdiagnosis and inappropriate treatment (5).

Health centers diagnose and initiate MDT for leprosy patients who seek health care of their own accord (passively) and present at health facilities.

These health facilities are also expected to manage mild reactions and refer severe reactions and complications to a hospital. Leprosy control is strongly dependent on the knowledge, attitude and skills of health workers in the recognition of the signs and symptoms of leprosy at an early stage of the disease (6-9).

Ethiopia established the Health Extension Program (HEP) in 2003; an innovative community based program and a strategy to move towards Universal Health Coverage (UHC) which helped the country achieve Millennium Development Goals (MDGs) (10). The main actors for the implementation of the program were Health Extension Workers (HEWs), young women assigned to work within the community they came from facilitating easy communication. They implement the 17 essential health packages developed by the FMoH (11). The roles of the HEWs in leprosy is visiting each household and screen all household members for signs and symptoms of leprosy and record and present the suspects to the health centers for confirmation by clinical nurses and health officers. They were given two days training at Kokosa Woreda.

This study was carried out to evaluate the Knowledge, Attitude and Practice (KAP) of the health workers in the health facilities of one of the Woredas with a relatively high burden of leprosy affected rural communities in Ethiopia, Kokosa Woreda.

Methods

Study site and study Settings
Kokosa Woreda is one of the five Woredas (district) in West Arsi Zone of the Oromia Regional State. The population of the Woreda is 175,184 with 36,495 households (HHs). There are 22 Kebeles and 22 health posts. Kokosa has 7 health centers namely: Kokosa, Boro, Bokore, Hogiso, Gerbe Hurufa, Hebano and Ararso. In this study, all (n=86) health workers were included: 12 health officers (HOs), 50 clinical nurses and 24 HEWs working in the study area.

Study design:
A cross sectional study was used and the KAP of health workers at Kokosa Woreda health centers was assessed at the start of the study. The design of the tool was adapted from Abeje's KAP work (8). Questionnaire from the previous study done by Abeje *et al* was adapted and the purpose of the study was explained to the study participants before they were asked to fill the questionnaires. After discussion with the leprosy experts and the research team, some of the questions were customized to our context. The practical skills of the health workers were assessed using a structured and standardized checklist by two experienced nurses who had worked on leprosy for more than 35 years in a leprosy referral hospital and in the field in the vertical programs. Active case detection pattern was assessed for five years period.

Active new case detection assessments' started in June 16/2016 and was completed in August 31/2017.

The new case detection was taken as an indicator of improvement of the KAP of the health workers for the two rounds of training given to the health workers in the area. The training focused on the three cardinal signs of leprosy (1)Hypopigmented or reddish lesions with loss of sensation, 2) enlarged peripheral nerves and 3) acid fast bacilli (AFB) in slit skin smear) that are basic in the diagnosis of leprosy; the differential diagnosis, how to do the sensory testing and voluntary muscle testing and manage leprosy complications that includes leprosy reactions and ulcers, how to classify the leprosy patients into multibacillary and paucibacilliary using WHO classification since their treatment is different. Besides they were trained in how to prescribe the three drugs (Rifampicin, Dapsone and Clofazamine) and also how to treat uncomplicated leprosy reactions with steroids and refer severe cases to hospitals. The HEWs were trained in the major signs and symptoms of leprosy and presenting them to health centers.

Sample size:
Eighty six health workers present during the study period were included for knowledge and attitude assessment and the health officers and the clinical nurses (72.1%) were further assessed for their skill in diagnosing leprosy.

Assessment of Knowledge and attitude:
Seventeen and 8 questions were used to assess knowledge and attitude of the health workers, respectively. Bloom's cut off point was used to measure knowledge of the respondents whereas their attitude was measured using Likert's scale (6) .

Those who couldn't correctly answer at least 8 out of the 17 knowledge questions were graded as having "low" knowledge about leprosy. Those who responded to 10-14 questions correctly were graded as "medium" and those who correctly answered >14 questions as having "high" knowledge of leprosy. For the 8 attitude questions asked, those who answered 3 or less questions related with attitude were considered as having "unfavorable" attitude and those who correctly answered to 4-5 as "intermediate" and ≥6 considered as "positive" attitude towards leprosy.

Assessment of skills:
Bloom's cut off point was also used to measure practice of HOs and clinical nurses when they examined a patient suspected for leprosy whereas simulation was used in the absence of leprosy suspects. Taking the relevant history in relation to leprosy, doing physical examination to reach to a diagnosis of leprosy, grading the disability,

classifying the disease and initiating treatment, prescribing the right drugs at the right dose for the right duration and explaining to the patient, and preparing patient treatment card and recording on the unit leprosy register was observed in the practical assessment. In the physical examination, they were observed when they performed skin examination for touch sensation, Sensory Testing (ST) for peripheral nerves and Voluntary Muscle Testing (VMT).

The assessment tool used had previously been tested in our previous KAP study done in Amhara and Oromia regions (8) and the grading was done by leprosy experts and researchers excluding the principal investigator (PI). (6) Among the thirty-three skill tests used to measure practical skills; those who performed ≤17 practical procedures correctly were graded as "unsatisfactory";18-25 as "satisfactory" and ≥26 as having "excellent" skill to diagnose leprosy.

Data analysis:
Data was entered on Open Clinical database and analyzed using R statistical software version 3.4.0. Proportions were calculated and the Chi-square test was used to examine associations between response and exposure (explanatory) variables. The level of significance was set at $p < 0.05$.

Operational Definitions:-
Grading knowledge, attitude and practice using
Blooms cut off and Likert's Scale (8)
Seventeen knowledge questions were asked and percent of correct response grading was done:
       Below 60 % (≤ 9/17), as low
       ≥60-80 % (10-14/17) as medium and
       Above 80 % (>14/17) as high knowledge of leprosy
Eight attitude questions were asked and Likert's scale was used to measure their response
       Less than 39 % (≤ 3/8) as unfavorable
       40-60 % (4-5/8) as intermediate
       Above 60 % (≥6/8) as positive attitude towards leprosy
Thirty-three skill tests were used to measure practical skills using Blooms cut off values:
       Below 59 % (≤17/33) as unsatisfactory
       60-80 % (18-25/33) as satisfactory

       Above 80 % (≥26/33) as excellent skill to diagnose leprosy

Results

Socio-demographic characteristics
Eighty-six health workers were included in the study. The female to male ratio of the respondents was nearly 1:1 with the median age of 24(IQR 2) years. Male study participants comprised 51.2 % and the duration of service years ranged from 5-14 years. The proportions of health workers by education status were 14% with first degree (BSc), 58.1% with diploma and 27.9% with 10 +1. Regarding training in TB/leprosy, only 32.1% had

training of less than 4 weeks either as a formal course or as a refresher course whereas the majority has not taken any training, although 60.5% of them were involved in activities of the leprosy control program (Table 1).

Table 1: Socio-demographic characteristics of health workers of Kokosa Woreda, Oromia region, Ethiopia, July 2015

Variables	Characteristics	Number	%
Sex	Male	44	51.2
	Female	42	48.8
Health workers Qualification	BSc degree	12	14.0
	Diploma	50	58.1
	10+1 (HEWs)	24	27.9
*Years of service (experience)	0-4	32	39.5
	5-14	39	48.2
	>15	10	12.3
Training in TB/leprosy	Yes	28	32.6
	No	58	67.4
**Involvement in leprosy control activities	Yes	52	60.5
	No	34	39.5

**Involvement means: HEWs =Screening patients and household contacts, HOs and Clinical nurses=diagnosing, treating and referring patients to hospital

*Five results missing, only 81 samples were included

Knowledge of Health workers

The majority of the participants, 62/86 (72.1%), showed low level of knowledge. Among HEWs, 91.7% had low level of knowledge. 67.4% of the participants had never taken any training in diagnosis, classification and treatment of leprosy. Among the participants, 71/81 (87.7%) had health service experience of below 15 years (Table 2). Short training was conducted in Kokosa for all the health workers following the KAP study findings in their local language, Oromiffa before the main study was started in 2016. Second training was also given to the health workers from the same Woreda and surrounding Woredas by our group before completing the data collection in 2018.

Table 2: Level of knowledge of health workers of Kokosa Woreda, Oromia Region, Ethiopia, July 2015

Variables	Knowledge score (%)				
	Low	Medium	High	Total	P -value
Health workers' qualification					
10+1	22(91.7%)	2(8.3%)	0(0%)	**24(27.9%)**	
Diploma	34(68%)	16(32%)	0(0%)	**50(58.1%)**	0.01
BSc.	6(50%)	5(41.7%)	1(8.3%)	**12(14.0%))**	
**Year of experience (years of Service)					
0-4	21(65.6%)	10(31.3%)	1(3.1%)	**32(39.5%)**	
5-14	32(82.1%)	7(17.9%)	0(0%)	**39(48.2%)**	0.47
>15	7(70%)	3(30%)	0(0%)	**10(12.3%)**	
Training in TB/ leprosy					
Yes	20(71.4%)	7(25%)	1(3.6%)	**28(32.6%)**	
No	42(72.4%)	16(27.6%)	0(0%)	**58(67.4%)**	0.35

**The years of service refers to the years that the health workers had been working as a health practitioner. It is not specific to leprosy work

  **Five results were missing, only 81 samples were included

Attitudes of Health workers

Likert's scale was used to describe the attitude of the respondents. Only 22/86 (25.6%) of the respondents had unfavourable attitude towards leprosy while 37/86 (43%) had intermediate attitude and 27/86 had unfavourable attitudes in this study refers to the attitude of health workers who 6 (31.4%) had positive attitude.

(Table 3). considers leprosy as a minor public health problem of the country; there is a high risk of contracting the disease while managing a leprosy patient with or without deformities and considers tracing of leprosy patients who do not come for treatment and tracing their family contacts is not important.

Table 3: Attitude levels of health workers in Kokosa Woreda, Ethiopia, July 2015

Variables	Levels of attitude (%)				
	Unfavorable	Intermediate	Positive	Total	P value
Health professional's qualification					
10+1	11(45.8%)	6(25%)	7(29.2%)	**24(27.9%)**	
Diploma	11(22%)	26(52%)	13(26%)	**50(58.1%)**	0.01
BSc	0(0%)	5(41.6%)	7(58.3%)	**12(14.0%)**	
Gender (sex)					
Male	5(11.4%)	22(50.0%)	17(38.6%)	**44(51.2%)**	
Female	17(40.5%)	15(35.7%)	10(23.8%)	**42(48.8%)**	0.01
*Years of experience					
0-4	6(18.7%)	19(59.4%)	7(21.9%)	**32(39.5%)**	
5-14	14(35.9%)	12(30.8%)	13(33.3%)	**39(48.2%)**	0.03
>15	1(10%)	3(30%)	6(60%)	**10(12.3%)**	
Training in TB/leprosy					
Yes	9(32.1%)	11(39.4%)	8(28.6%)	**28(32.6%)**	
No	13(22.4%)	26(44.8%)	19(32.8%)	**58(67.4%)**	0.63

  *Five results were missing, only 81 samples were included

Level of Practice of Health workers

Among the 86 health workers, 62 participated in the practical assessment. Only 4/62 (6.5 %) of them diagnosed leprosy correctly. The remaining 58/62 (93.6%) were found to have substandard level of practice. No health worker 0(0%) showed best practice (excellent) (Table 4).

Table 4: Level of practice of health workers in Kokosa Woreda health facilities, Ethiopia, July 2015

Variables	Level of practice (%)				
	Unsatisfactory	Satisfactory	Excellent	Total	P- value
Health worker's qualification					
Diploma	46(92%)	4(8%)	0(0%)	**50(80.6**%)	0.31
BSc	12(100%)	0(0%)	0(0%)	**12(19.4%)**	
Gender (sex)					
Male	39(90.7%)	4(9.3%)	0(0%)	**43(69.3%)**	0.17
Female	19(100%)	0(0%)	0(0%)	**19(30.6%)**	
***Years of service (experience)**					
0-4	27(93.1%)	2(6.9%)	0(0%)	**29(50.0%)**	0.89
5-14	18(94.7%)	1(5.3%)	0(0%)	**19(32.8%)**	
≥15	9(90.0%)	1(10.0%)	0(0%)	**10(17.2%)**	
Training in TB/leprosy					
Yes	13(92.9%)	1(7.1%)	0(0%)	**14(22.6%)**	0.91
No	45(93.7%)	3(6.3%)	0(0%)	**48(77.4%)**	

** Four results are missing among the 62 health workers

New case detection at Kokosa Woreda

We assessed the improvement of case detection before giving the first training (2015). We had given the second round of training at year three. As can be seen clearly from table 5, the trend of case detection in the Woreda remained the same except for the year we had been working on active case detection in the Woreda.

5 years of new leprosy cases (years (G.C.) in Kokosa					
Number of cases detected	**2015/ 2016**	**2016/2017**	**2017/2018**	**2018/2019**	**2019/2020**
	52	**91**	54	21	24

Inadequate recording and reporting practices

Relevant documents (leprosy unit register and reports) of the 7 health centers of Kokosa Woreda were reviewed in order to see if there was proper documentation and if the health providers worked according to FMoH guidelines of data capture. The checklist consisted of 13 questions. None of the health centers 7 (100%) prescribed steroids and nor did they do the monthly assessment of VMT and ST as shown in Table 6.

Table 6: Descriptive result of checklist for review of leprosy record and reports (for MDT clinic health workers +Workshop)

S.no	Checklists	Yes	No	Partial
1	Is all the essential information recorded in the patient treatment card?	1(14.3%)	5(71.4%)	1(14.3%)
2	Is the patient information registered in the unit leprosy register complete, and correct?	1(14.3%)	1(14.3%)	5(71.4%)
3	Are disability grades recorded completely and correctly?	3(42.9%)	3(42.9%)	1(14.3%)
4	Are attendances filled in correctly and completely?	3(42.9%)	1(14.3%)	3(42.9%)
5	Are steroid doses recorded correctly and completely?		7(100%)	
6	Do VMT/ST forms used routinely for leprosy patients on treatment?		7(100%)	
7	Is the information on the VMT/ST form filled out completely and correctly?		7(100%)	
8	Is there a record of collection and distribution list of footwear and appliances for prevention of disabilities?		7(100%)	
9	Is the treatment outcome recorded correctly and completely?	1(14.3%)	6(85.7%)	
10	Is the unit register updated regularly?	3(42.9%)	3(42.9%)	1(14.3%)
11	Does the health worker compile quarterly reports?	6(85.7%)	1(14.3%)	
12	Are there copies of a report of case finding and treatment outcome for the past 1 year?	3(42.9%)	4(57.1 %)	
13	Is the report consistent with the cases registered?	5(71.4%)	2(28.6%)	

Discussion

In this study, all the health workers except one (85/86) were found to have poor knowledge of the early signs and symptoms of leprosy, its treatment, and management of leprosy reactions. Overall, there were 72.1%, 26.7% and 1.2% of health workers with low, medium and high knowledge, respectively. Knowledge score is increased as the level of education increase and it has a statistically significant correlation between knowing leprosy and level of education (p-0.01). A quarter (25.6 %) of health workers had unfavourable attitude to the disease and only a third (31.4%) had positive attitudes. The health workers' attitude improves as their years of experience increase, as shown in table 3, of the workers that have 0-4 years of experience only 21.1% of them has a positive attitude, again when their experience is more than 15 years about 60% of them holds a positive attitude score in regards to leprosy. Only 8 % had sufficient skills to conduct a proper clinical examination and diagnose leprosy correctly.

The new case detection of new leprosy cases in Kokosa in the years prior to our study were recorded as 52 (2014/2013), 21 (2013/2012) and 27 (2012/2011). New leprosy cases from Kokosa have shown a declining trend after our study showing that there was poor leprosy knowledge in the capacity of diagnosing leprosy cases since after our withdrawal the numbers of leprosy cases were decreased. In addition, the HEWs are responsible to deliver 17 health packages to the local community. The workload may not allow them to give attention to leprosy related activities and improve their knowledge in the area (11).

From the observations made in the follow-up, it was noted that the training does not improve the case detection rate which could be attributed to the case detection modalities. Though the health workers took the training; they still practice the passive case detection method on the patients that come to the health facilities. The case detection rate showed improvement when we employed the active case detection. Thus, the method needs re-assessment in a large scale and may need to switch to active case detection modalities.

In Ethiopia, the HEWs play the role of connecting the community with the health facilities and are responsible for creating awareness in the community about leprosy, and in screening the households and their contacts. Hence, they need proper training to be able to identify the signs and symptoms of leprosy and bring leprosy suspected individuals to the health facilities for further screening and confirmation (11, 12).

In our study, none of the respondents was capable of carrying out ST and VMT. When patients visit the health facilities for their monthly MDT, they should be assessed for VMT and ST, but this was not done because of lack of expertise or proper practical training (13). The performance of the health workers did not show any significant association with their level of qualification, in-service trainings and years of experience unlike Abeje's study which showed a significant association (8). Nerve damage as one of the leprosy complications can be reliably tested by ST and VMT, the basic diagnostic tests to prevent disabilities and deformities. ST can be used alone in situations where VMT cannot be done though it will be very useful if both methods are used (14, 15).

Low knowledge, lack of practice after training and absence of post training supervisions could be some of the reasons that contributed to the low level of performance in our study. KAP studies conducted among health workers involved in leprosy management in Bangladesh have shown that training played a key role in improving their knowledge. In Sri Lanka, health education had a sound effect on early case detection and contact tracing. Besides inclusion of leprosy in the continuous medical education programs for health workers, refresher training was considered important for improved performance of the leprosy control program. An Indian study also supported the need for refresher training and recommended training of new recruits as key activity to be considered by health planners (16-18).

There was also a major gap in recording treatment outcome in 6 of the 7 health centers which indicates the possibility of improper patient management. As a result, some cases were treated for longer periods and some others were treated below the WHO standard. This may lead to relapses and emergence of drug resistant strains, which will have an impact on the leprosy control program. Additionally, the high staff turnover, rotation of the trained staff on leprosy was also the program challenges. This calls for the attention of the Woreda and Zonal Health Bureau TB and Leprosy Focal Persons for a strict and continuous supervision in order to improve the recording and registration gaps observed in Kokosa Woreda health centres.

Conclusion

In conclusion, the study showed that the majority of health workers had low knowledge of leprosy and lacked the practical skills of physical examination. Very few health workers were able to diagnose leprosy correctly. In order to improve the knowledge and practice of the clinical nurses and the HOs, basic training of leprosy on the cardinal signs of leprosy, differential diagnosis of leprosy, differentiating leprosy reactions and its management, knowing the type of disabilities, classifying and grading has to be included. Taken together, strengthened training on early diagnosis of leprosy is critical that will aid the leprosy control program of the country in line with the WHO strategies.

Limitations

- The trainings conducted in Kokosa Woreda and the second training at Shashemene was short: each were given for 2 days only.
- Post training KAP assessment was not done due to the high staff turnover; more than 50% of the trained staff has left the Woreda.

Abbreviations:

AHRI: Armauer Hansen Research Institute; FMoH: Federal Ministry of Health; GHS: General Health Service; HEWs: Health Extension Workers; HO: Health Officer; MDT: Multidrug treatment; WHO: World Health Organization.

Competing interests: The authors report no conflicts of interest.

Authors' contributions
TL, KB, TA, and AA designed the study protocol; TL, KB, and AM conducted the field activities; TL and KB drafted the manuscript; SA, TH, EN, YB, TA and LY involved in formulation of the questionnaire and data analysis; AA, EN, YB and YW, read and commented the manuscript;

All authors contributed to the interpretation of the data and writing of the manuscript and read and approved the final version.

Ethical considerations

Ethical approval was obtained from AHRI/ALERT Ethical Review Committee (AAERC), PO37/2014; and the National Research Ethics Review Committee (NRERC), A.A, Ethiopia, (3-10/014/2015). The study also had support letter from the Oromia Regional Health Bureau. The participants were informed about the study and all agreed to participate and gave informed verbal consent. All data were anonymized and confidentiality was maintained.

Author details

[1]Addis Ababa University, College of Health Science, P.O.box 9086; Addis Ababa, Ethiopia, [2]Armauer Hansen Research Institute, P.O.box 1005, Jimma Road, Addis Ababa, Ethiopia. [3]London School of Hygiene and Tropical Medicine, Keppel Street, WC1E7HT, London, UK,

References

1. Lockwood DN, Suneetha S. Leprosy: too complex a disease for a simple elimination paradigm. Bulletin of the World Health Organization. 2005;83(3):230-5.
2. WHO. Multidrug therapy against leprosy: development and implementation over the past 25 years. WHO, Geneva, Switzerland. 2004.
3. WHO. Global leprosy (Hansen disease) update, 2019: time to step-up prevention initiatives–Situation de la lèpre (maladie de Hansen) dans le monde, 2019: le moment est venu d'intensifier les initiatives de prévention. Weekly Epidemiological Record= Relevé épidémiologique hebdomadaire. 2020;95(36):417-38.
4. Wamai RG. Reviewing Ethiopia's health system development. Population (mil). 2004;75.
5. Feenstra P, Visschedijk J. Leprosy control through general health services-revisiting the concept of integration. Leprosy Review. 2002;73(2):111-22.
6. Asnake MK, Ahmed M, Genebo T, Mekebib B. Knowledge and attitude of health professionals in relation to the integration of leprosy control into the general health service in Ethiopia. International journal of leprosy and other mycobacterial diseases. 2000;68(3):299.
7. Chen S, Zhang L, Liu D, Liu B. Should household contact examination in a low endemic situation of leprosy continue? International journal of leprosy and other mycobacterial diseases. 2003;71(2):95-100.
8. Abeje T, Negera E, Kebede E, Hailu T, Hassen I, Lema T, et al. Performance of general health workers in leprosy control activities at public health facilities in Amhara and Oromia States, Ethiopia. BMC Health Serv Res. 2016;16:122.
9. Briden A, Maguire E. An assessment of knowledge and attitudes towards leprosy/Hansen's disease amongst healthcare workers in Guyana. Leprosy review. 2003;74(2):154-62.
10. Ruducha J, Mann C, Singh NS, Gemebo TD, Tessema NS, Baschieri A, et al. How Ethiopia achieved Millennium Development Goal 4 through multisectoral interventions: a Countdown to 2015 case study. The Lancet Global Health. 2017;5(11):e1142-e51.
11. Workie NW, Ramana GN. The health extension program in Ethiopia. 2013.
12. Rehman Soomro F, Murtaza Pathan G, Seema Bhatti N, Hussain J. Awareness of leprosy--knowledge and practices among general practitioners in leprosy endemic areas of Larkana region, Sindh, Pakistan. Journal of Pakistan Association of Dermatologists. 2013;23(3).
13. FMoH. National Guidelines for TB, DR-TB and Leprosy in Ethiopia, 6th ed. Addis Ababa :Federal Democratic Republic of Ethiopia, Ministry of Health. 2018.
14. Owen B, Stratford C. Assessment of the methods available for testing sensation in leprosy patients in a rural setting. Leprosy review. 1995;66:55-.
15. Lewis S. Reproducibility of sensory testing and voluntary muscle testing in evaluating the treatment of acute neuritis in leprosy patients. Leprosy review. 1983;54(1):23-30.
16. Kabir H, Hossain S. Knowledge on leprosy and its management among primary healthcare providers in two districts of Bangladesh. BMC health services research. 2019;19(1):787.
17. Wijeratne MP ØT. Knowledge, attitudes and practices relating to leprosy among public health care providers in Colombo, Sri Lanka. Lepr Rev. 2017;88:75-84.
18. Kar S, Ahmad S, Pal R. Current knowledge attitudes, and practices of healthcare providers about leprosy in Assam, India. Journal of global infectious diseases. 2010;2(3):212.