Policy Briefs 2021

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POLICY BRIEF -1.1 | THEME | I
May 2021

Breed Type and Management Practices are Factors Causing Bovine Clinical Mastitis Treatment Failure in Eastern Ethiopia

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Key messages

•Mastitis is becoming a disease of major economic burden with a high incidence rate and treatment failure.
•Fungi exposed cows are more likely to end with unsuccessful treatment than other pathogens.
•Breed, age, parity, lactation stages and management practices were found significant risk factors of mastitis treatment failure.

Introduction

Bovine mastitis is a major disease affecting dairy cattle worldwide and remains the most economically important disease of dairy farms in developed and developing countries. It is usually believed that bacteria are the only pathogens to cause clinical mastitis (CM) although Mastitis is also caused by fungi in dairy cows which are on the rise. Curative treatment is the recommended routine practice from a welfare and economical point of view to manage this disease. However, the cure rate of mastitis caused by fungi pathogens is usually low. Most commonly, drug resistance is the only anticipated factor for treatment failure though it is influenced by different factors such as pathogens, host, environmental and iatrogenic factors (drugs used, route of administration, treatment duration and initial treatment period are the main). This study was initiated to investigate factors associated with treatment failure in bovine clinical mastitis and its incidence in the selected dairy farms.

Approaches and results

Six dairy farms from Dire Dawa and Harar were selected and 465 cows were followed to determine the rate of incident cases of mastitis and 98 cows with new cases of mastitis were followed for antibiotic treatment outcome after being treated and/or intervened by the farm health managers in each respective farms. The overall incidence of mastitis in dairy cattle at the farm level was 21.1% (17.40-25.10). A high rate of treatment failure (70.40%) was observed from cases with clinical mastitis (Table 1). Among the mastitis cows tested 57.14% (95% CI=46.7-67.0) were found to harbor fungal pathogens such as A. fumigates, C. alibicans and A. negeri (Figure 1).

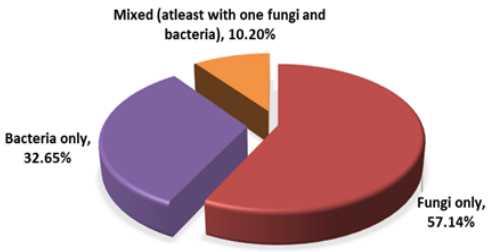

Figure 1. The proportion of isolated pathogens from cow milk with mastitis

Table 1. Cumulative incidence of mastitis treatment failure based on intrinsic risk factors in dairy cows located at Harar and Dire Dawa dairy farms, n=98

Factors	Category	Treatment		Total	CI (95% CI)
		Success	Failure		
Breed	Jersey	7	31	38	81.5 (65.7-92.3)
	Holstein	22	38	60	63.3 (49.9-75.4)
	Total	29	69	98	
Age	Adult	24	39	63	61.9 (48.8-73.8)
	Young adult	5	30	35	85.7(69.7-95.1)
	Total	29	69	98	
Parity	1-4	22	50	72	64.1(52.4-74.8)
	>4	1	19	20	95(75.1-99.8)
	Total	29	69	98	
Lactation stage (day)	1-150 (early)	27	38	65	58.4 (45.5-70.5)
	>150 (late)	2	31	33	94.2 (80.8-99.3)
	Total	29	69	98	
Average daily milk (L)	≤15	18	26	44	59.1 (43.2-73.6)
	>15	11	43	54	79.6 (66.4-89.3)
	Total	29	69	98	

Dairy cows with fungal pathogens were 2.7 times (RR=2.7; 95 % CI=1.79 - 4.06) more likely to encounter mastitis treatment failure than those without fungal infection, whereas those with bacterial pathogens were 1.4 times (RR=1.4; 95% CI=1.12 - 1.77) more likely to encounter mastitis treatment failure than those without bacterial pathogens. Those with both fungal and bacterial mastitis were 1.32 times (RR=1.32; 95% CI=1.02 - 1.69) more likely to encounter mastitis treatment failure than their counterparts.

Among the potential intrinsic risk factors: being a Jersey breed, adult in age, with greater than four parities, at late lactation stage, and with an average daily milk yield of above 15 liters were at higher risk to develop treatment failure than their counterparts (P<0.05).

Regarding management-related factors, cows with teat lesion and more than one blind teat and poor floor type, hand washing practice, cow and farm hygiene, body condition bedding materials and few milking personnel were found significant predictors of bovine clinical mastitis treatment failure Besides, lack of dry cow therapy, udder washing, defective milking procedure, isolation of mastitis infected cow from the heard, quarter disinfection, taking intramuscular injection than inframammary infusion were also other significant predictors of bovine clinical mastitis treatment failure (P<0.05).

Policy recommendations

- Routine diagnosis protocols for isolation and identification of pathogens causing mastitis and confirmatory based treatment should be developed and implemented.
- Treatment targeting Aspergillus and Candidias species should be implemented to mitigate mastitis in eastern Ethiopia.
- Urgent awareness creation and introduction of antimicrobials that target fungal etiologies should be given priority to combat mastitis treatment failure in dairy farms.

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POLICY BRIEF -1.2
May 2021

THEME I

Dried Bovine Blood and Rumen Content Mixture: A Promising Protein Supplement in Layers Ration

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Key messages

•Mixed bovine blood and rumen content at 8% in the ration of egg-laying Bovan Brown hens can substitute an expensive feed ingredient (soybean and noug cake) without affecting feed intake, laying performance and egg quality.

Introduction

to the poor production and productivity of poultry farms. Low cost and locally available alternative feed ingredients that replace these feedstuffs which can be consumed directly or as byproduct could be of paramount importance. Researchers have been exerting their efforts in searching for such alternative feed ingredients. In this regard, locally available dried bovine blood and rumen content which are an abattoir (slaughterhouse) waste that are simply disposed into the environment can be potential substitute protein source feedstuff for poultry. Besides, utilization of these by-products could maximize the economic benefits (cost effective) and minimize the environmental pollution. Previous reports indicated that these byproducts contain high protein and have no side effects on poultry health and performance. However, limited efforts have been made in the Ethiopian context to utilize these waste products as alternative feed ingredients in layers rations. This work was initiated to evaluate the feeding value of dried bovine blood and rumen content mixture as an alternative protein supplement in the ration of egg-laying hens. est changes and modifications in Ethiopia during the past decades. However, limited studies have been attempted to address the prediction of spatial dynamics and temporal characteristics of forest cover changes. Therefore, this study was designed to evaluate the historical changes and predict the future state of forest cover in Eastern Ethiopia.

Approaches and Results

In this study, different rations were formulated from a mixture of corn grain, wheat short, noug seed cake, soybean meal, processed and dried bovine blood and rumen content mixture (BRC), vitamin premix, salt, limestone and di-calcium phosphate (Table 1). The chemical composition of formulated feeds was determined from representative samples following standard procedures. Based on the analysis results Four treatment rations were selected and made iso-caloric and iso-nitrogenous with 2800 kcal ME/kg dry matter (DM) and 16% crude protein (CP) to meet the nutrient requirements of layers (Table 1 and 2). A total of 180 Bovan Brown layers of 32 weeks of age were assigned into four dietary treatments containing different levels of dried bo-

Table 1. The proportion of feed ingredients (%) used in formulating the experimental ration

	Treatments			
Ingredients (%)	BRC0	BRC8	BRC16	BRC24
Dried bovine blood	0	4	8	12
Dried rumen content	0	4	8	12
Noug cake	10	10	7	0
Soybean meal	14	6	1	0
Wheat short	29.7	20.7	8.7	2
Maize	38	47	59	65.6
Limestone	7	7	7	7.1
Salt	0.5	0.5	0.5	0.5
Vitamin-premix	0.8	0.8	0.8	0.8
Total	100	100	100	100

BRC0: 0% dried bovine blood-rumen mixture (control); BRC8: 8% dried bovine blood-rumen content mixture; BRC16: 16% dried bovine blood-rumen content mixture and BRC24: 24% dried bovine blood-rumen content mixture

Dry matter and nutrient intake, body weight change, hen-day egg production, egg weight and egg mass, feed conversion ratio, egg quality parameters data were collected. A total of 360 eggs were used for internal egg quality analysis of which 48 egg samples were randomly taken (4 eggs per replication and 12 eggs per treatment) for sensory evaluation. Egg samples (separate albumen and yolk) from each treatment were randomly presented to a trained panel of experts for sensory evaluation. Panelists were introduced to evaluation techniques such as taste, aroma, flavor and overall acceptance and inquired to rate the samples on the bases of a 7-point hedonic scale (1= strongly disliked; 2= moderately disliked; 3= slightly disliked; 4= indifferent; 5= slightly liked; 6= moderately liked, and 7= strongly liked).

The crude protein content of BRC was relatively high making them good protein supplement feed ingredients for layers (Table 2). In all treatment rations, the CP and metabolizable energy (ME) ranged from 16-18% and 2811-2945 kcal/kg DM, respectively (Table 3), which is found to be within the range recommended by NRC (1994) for layers.

Table 3. Chemical composition of treatment diets containing a different proportion of the dried bovine blood-rumen content mixture

	Feed Ingredients						
Nutrients	Blood	Rumen content	BRC	NSC	SBM	WS	Maize
DM	89.43	91.99	91.22	92.41	92.58	89.56	89.11
CP % DM	83.00	10.00	46.93	29.00	44.00	11.00	10.00
EE %DM	0.86	1.86	1.47	8.11	7.83	4.24	5.72
CF %DM	0.83	29.44	14.09	5.83	4.48	5.53	2.63
Ash %DM	3.06	16.67	9.59	7.37	6.26	6.45	1.72
Ca %DM	0.96	0.67	1.48	0.58	0.44	0.56	0.04
P % DM	0.49	1.64	0.98	0.54	0.7	0.59	0.33
ME Kcal/Kg	3799.32	760.72	2389.91	3574.37	3724.17	3427.99	3958.71

DM= Dry matter; CP = Crude protein; EE= Ether extract; CF = Crude fiber; Ca= Calcium; P = Phosphorus; ME= Metabolizable energy; BRC= bovine blood-rumen content mixture; NSC= Noug seed Cake; SBM= Soybean meal; WS= Wheat short; kcal= kilo calorie; kg= kilo gram

Table 3. Chemical composition of treatment diets containing a different proportion of the dried bovine blood-rumen content mixture

	BRC0	BRC8	BRC16	BRC24
DM (%)	92.08	90.16	90.94	90.68
CP	16.18	17.11	17.45	18.05
EE	3.8	3.89	4.16	5.09
CF	7.49	8.23	9.13	9.08
Ash	13.44	13.24	13.63	13.61

DM= Dry matter; CP= Crude protein; EE= Ether extract; CF= Crude fiber

The inclusion of BRC at 8% in the diet of layers improved feed intake, egg production, egg mass and feed conversion ratio, and decreased as the inclusion level increase above 8 (Table 4). The inclusion of BRC in the diet of layers improved egg quality parameters (Figure 1) and not affected the quality of egg albumen and yolk (Table 5).

Table 4. Mean values for feed intake and laying performance

	BRC0	BRC8	BRC16	BRC24	SEM	p-value
DM intake, g/d	92.9^{a}	94.65^{a}	86.40^{b}	84.66^{b}	1.33	0.0002
CP intake, g/d	16.32^{b}	17.96^{a}	16.58^{b}	16.85^{b}	0.2	0.0009
ME kcal /b/d	297.13^{a}	303.63^{a}	267.09^{b}	267.08^{b}	5.18	0.0001
Egg weight (gm)	59.89^{b}	61.06^{a}	59.24^{b}	58.87^{b}	0.27	0.001
HDEP (%)	57.14^{ab}	64.34^{a}	53.84^{bc}	47.52^{c}	2	0.002
Egg mass	34.21^{ab}	39.28^{a}	31.92^{bc}	28^{c}	1.33	0.001
Feed conversion ratio	3.08^{b}	2.79^{b}	3.14^{ab}	3.66^{a}	0.11	0.008

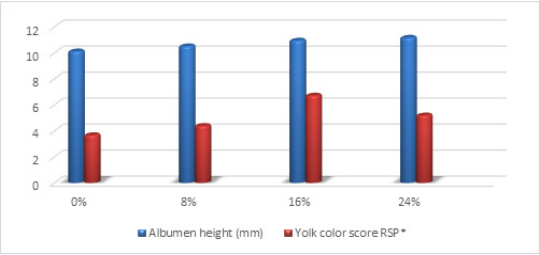

Figure 1. Effect of feeding BRC on egg quality parameters

The highest net return was observed in layers fed with BRC8 ration followed by BRC16, BRC0 and BRC24. The marginal rate of return also showed that an additional income of 116.76 ETB can be obtained from the BRC8 ration for each additional unit of 1 ETB per hen egg cost increment.

Recommendations

•Dried bovine blood and rumen content mixture can be a promising substitute for soybean and noug seed cake as a source of protein supplement in the diets of Bovans brown layers.

•Ministry of Agriculture and other stakeholders should capacitate private and public sectors working in the area of poultry feed processing to utilize bovine blood and rumen content mixture as a protein supplement.

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POLICY BRIEF-1.3 | THEME | I
May 2021

Integrated Remote Sensing and Cellular Automata Markov Revealed Declining Forest Cover in Eastern Ethiopia

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Key messages

•The spatial distribution patterns of forest cover in Eastern Ethiopia were progressively declined between 1990 and 2020.

•The expansion of shrublands, agricultural lands and built-up areas were the main factors that have contributed to the decline in forest cover.

Introduction

Forest is a vital resource required to ensure livelihoods by providing essential commodities, food sources, energy, and income. It also has essential benefits in the ecosystem and its functioning, which includes sequestrating and storing carbon stock, shaping greenhouse gases concentration, keeping water-energy fluxes, and serving as a natural buffer to climate change. Despite their importance, forests have long been exposed to widespread deforestation induced by natural and anthropogenic factors. The most substantial amount of deforestation and forest cover losses are exhibited in tropical regions. Particularly, the problem is serious in developing countries, like Ethiopia where a significant portion of the population depends on forest resources to meet their demand. In Ethiopia, reports have indicated that more than 2.6 million hectares of the forest areas were lost during the period of 1990–2015 contributing to the decrease of 15.11 million hectares of forest coverage to 12.51 million hectares. The most widely recognized factors that have caused forest cover changes are attributed to human-caused pressures. Besides, numerous remote sensing studies have evaluated spatiotemporal forest changes and modifications in Ethiopia during the past decades. However, limited studies have been attempted to address the prediction of spatial dynamics and temporal characteristics of forest cover changes. Therefore, this study was designed to evaluate the historical changes and predict the future state of forest cover in Eastern Ethiopia.

Approaches and Results

The study was conducted in the Harari Regional State, East Hararghe Zone, and West Hararghe Zone, Ethiopia (Figure 1). The study employed and processed a geospatial dataset accessed from satellite images onboard Landsat 5 Thematic Mapper (TM) from 1990, 2000, and 2010 and Landsat 8 Operational Land Imager (OLI) from 2020 (Figure 1). The images were classified to produce the forest cover maps using the train support vector machine (SVM) algorithm in the ArcGIS software version 10.8 (Environment Systems Research Institute (Esri), Inc. Redlands, CA, USA).

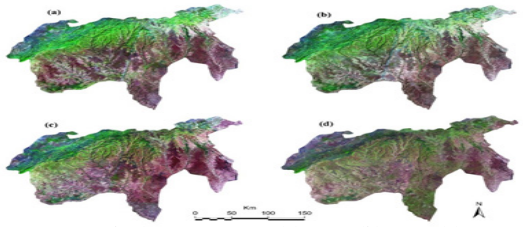

Figure 1. Landsat 5 TM imagery: (a) 1990; (b) 2000; (c) 2010 in a false color composite (band 5, 4, 3); and Landsat 8 OLI image: (d) 2020 also in a false color composite (band 6, 5, 4).

The proposed method for forest and forest area change prediction was characterized by three segments of outputs in CA-Markov model: the quantitative analysis of the change's trajectories of forests, a net conversion, and relative contributions to net change during the period of evaluation. The model is a spatially dynamic model that considers spatial structures of land-use and land cover (LULC) classes and their temporal changes. The spatial distribution patterns of forest cover corresponding to the study years (i.e., 1990, 2000, 2010 and 2020) showed a progressive decline in forest cover from northwest and northeast to southwestern and southeastern zones between 1990 and 2020. The intensity of high forest areas was concentrated along the uplands in the northern part in the year 2020 (Figure 2).

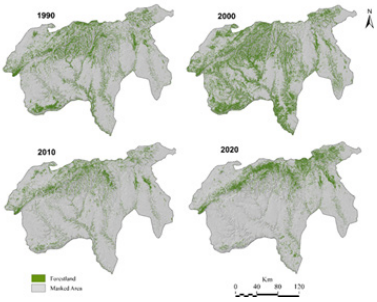

Figure 2. Change trajectory in the spatial extent of the forest cover

The results indicated a continuous decrease of forestland from its original cover of 5,091.80 km2 in 1990 to 3,070.05 km2 in 2020 (Table 1). This led to an overall loss of 2,021.75 km2 (39.71%) throughout the past three decades (1990-2020) with an annual loss rate of 3.97%. The forest cover has slightly increased by 4.87% during the first study period (1990-2000) (Table 2). However, it experienced a continuous decreasing trend in the subsequent decades of 2000-2010 and 2010-2020 by 35.51% and 10.85%, respectively.

Table 1. Area statistics of LULC classification for 1990, 2000, 2010 and 2020

LULC Class	1990		2000		2010		2020	
	Km²	%	Km²	%	Km²	%	Km²	%
Bareland	3,525.48	8.22	3,512.74	8.19	5,350.45	12.48	3,348.67	7.81
Built-up	66.56	0.16	90.97	0.21	109.00	0.25	233.41	0.54
Farmland	19,737.22	46.04	27,461.29	64.05	22,103.19	52.02	18,568.14	43.31
Forest	5,091.79	11.88	5,598.73	13.45	3,443.59	8.03	3,070.04	7.16
Grassland	172.92	0.40	41.64	0.10	114.40	0.27	183.01	0.43
Shrubland	14,263.43	33.27	6,409.92	14.95	11,541.93	26.92	17,432.55	40.66
Water bodies	15.62	0.04	16.74	0.04	10.47	0.02	36.21	0.08
Grand Total	42,873.04	100.00	42,873.03	100.00	42,873.04	100.00	42,873.04	100.00

Table 2. Change trajectory in the spatial extent of the forest cover

	Rate of Changes			
Year	Km²	%	Km²/year	%/year
1990-2000	247.94	4.87	24.79	0.49
2000-2010	–1,896.14	–35.51	–189.61	–3.55
2010-2020	–373.55	–10.85	–37.36	–1.08
1990-2020	–2,021.75	–39.71	–202.18	–3.97

T[illegible] tendency of landscape transformation. The expansion of shrubs, farmlands and built-up areas were major factors contributing to forest cover decline in the study area (Table 3).

Type of transition	Years		
	1990-2000	2000-2020	2020-2030
Forest to bareland	64.17	53.23	4.52
Forest to built-up	4.23	10.53	11.30
Forest to farmland	1,538.81	1,464.76	688.87
Forest to grassland	1.85	2.01	1.51
Forest to shrubland	769.73	1,847.25	1,135.30
Forest to water bodies	3.02	1.70	4.17
Losses	2,381.62	3,409.48	1,845.58

The prediction results revealed that drastic forest area fragmentation and deterioration are likely to occur in the future if the trends of forest cover change continue without sustainable measures.

Policy recommendations

- Ethiopian Ministry of Environment, Forest and Climate change, and other stakeholders should take appropriate measures on effective management of available forest resources.
- Temporal monitoring of forest cover and developing policies on establishing sustainable management of forests should be prioritized at a national level.

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POLICY BRIEF-2.1 | THEME | II
May 2021

Leprosy patients remain hidden and undiagnosed in the community: Fedis Woreda, Eastern Ethiopia

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Key messages

•High numbers (9.3/10,000 population) of leprosy cases were hidden in the community against the elimination target of <1 /10, 000 population.
•Significant number of grade II disability (visible deformity) patients among newly diagnosed cases was observed.
•The result indicates leprosy positivity has no association with family history.

Introduction

Leprosy or Hansen's disease is a chronic infectious disease that remains the leading cause of physical disability. Reliance on the patients visit to the health services and lack of community knowledge regarding leprosy leads to significant proportion of patients to remain hidden in the community. This results in a longer delay of diagnosis that could lead to visible disability. Although reports in Ethiopia have shown evidence of an increasing trend of disability rate induced by leprosy, the extent of hidden leprosy remains unexplored. Active case detection and household contacts (HHCs) tracing are important tools for leprosy control in high endemic areas: earlier diagnosis, treatment, and decrease in disability and potentially minimize spread of infection. However, in Ethiopia leprosy case-finding of active cases still relies on examining patients attending health facilities by themselves (passive case detection). Therefore, this study aimed to determine the extent of hidden leprosy patients among the population of Fedis Woreda, Eastern Ethiopia.

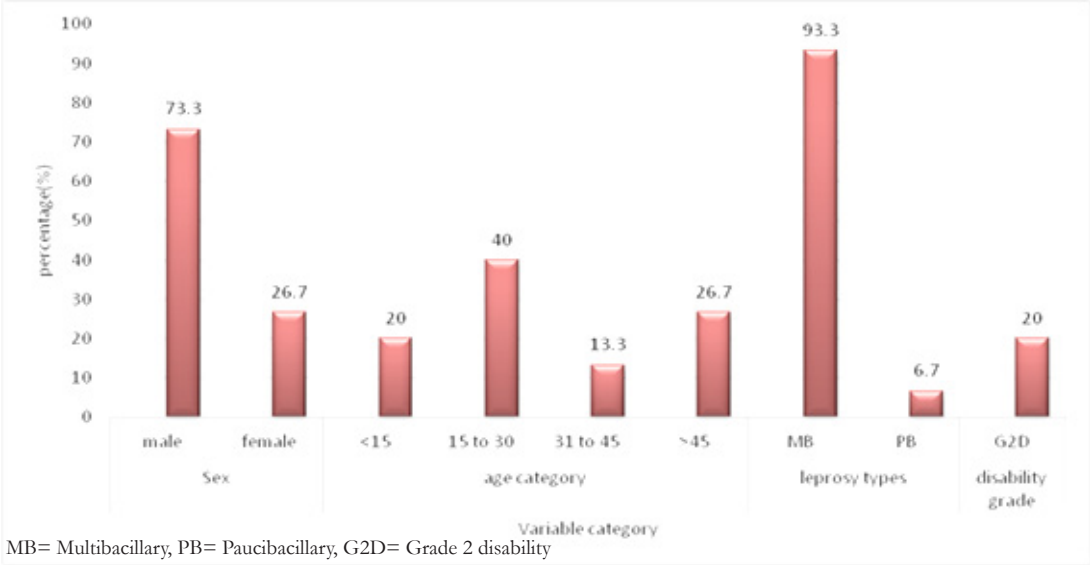
Approaches and Results

A community-based survey, covering six randomly selected Kebeles was conducted between July and October 2019 in the Fedis district of Eastern Ethiopia. Health extension workers (HEWs) identified the leprosy suspects through house-to-house interviews and screening. The experts performed a physical examination for all consented individuals and HHCs. Besides, bacteriological examination from a slit skin smear and assessed nasal nucleic acid (DNA) carriage using conventional PCR for all healthy HHCs and randomly selected healthy endemic controls (with no known contact with leprosy patient) were done.

Health extension workers visited 4798 households and identified 262 eligible study participants (214 with skin lesions suspected of leprosy and 48 household contacts) who were all investigated for leprosy. Fifteen study participants were confirmed to have leprosy, giving a detection rate of 5.7% (95%, CI: 3, 9). This yielded a total population-based prevalence of hidden leprosy to be 9.3 per 10,000 population, which is far beyond the elimination target (< 1 per10, 000 population). Among the newly diagnosed cases 11 (73.3%) were male. In terms of age, 3(20%) of newly diagnosed cases were younger than 15 years. The majority, 14 (93.3%), of them were multibacillar

leprosy (advanced stage) and 3 of them demonstrated grade II disability (visible deformity) at screening stage (figure 1). There was no statistical difference in the detection rate between participants with and without a history of contact (family history) with a known leprosy case and their demographic characteristics.

Nasal swab analysis with PCR indicated that 11.4% (95% CI: 3, 24) of HHCs of untreated multibacillary (MB) patients were colonized by M. leprae. All healthy ECs were negative for nasal swab DNA analysis. In this study, about 27% HHCs had cohabitation for more than 96 months and one-third of were siblings and 20.8% were offsprings. The DNA positivity rate was significantly different among HHCs and ECs (P=0.022) and associated with disability grade within the patient group (P=0.003).



MB= Multibacillary, PB= Paucibacillary, G2D= Grade 2 disability

Figure 1. Distribution of Hidden leprosy in Fedis Woreda, 2019

Policy recommendation

•National and regional health bureau should prioritize community-based active case detection surveillance along with contact screening strategy in known leprosy hotspots to improve early case detection and mitigate disease transmission.

•Local and national health offices should give attention toward increasing community understanding on mode of transmissions, early sign and symptoms of leprosy.

•Wider community awareness creation is needed to generate a positive attitude towards leprosy in the community and to avoid or minimize leprosy related stigma.

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POLICY BRIEF -2.1 | THEME | II
May 2021

Intimate partner violence during pregnancy is prevalent in Eastern Ethiopia

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Key messages

•Intimate partner violence during pregnancy (IPVP) is prevalent, with psychological violence being the leading followed by physical and sexual violence.
•Nearly, one-third of women respondents had experienced at least one of IPVP.

Introduction

Intimate partner violence against women is any physically aggressive, psychologically abusive and sexually coercive act enacted towards women by their current or former male intimate partner. It is a public health problem and a gross violation of human rights. The consequences of this violation are severe during pregnancy as the fetus or newborn could also be affected negatively.

Intimate partner violence during the pregnancy (IPVP) has not been acknowledged as a significant public health concern and, thus, it has not received adequate attention at the policy level. Evidences available on the situation of IPVP in the country are scanty and most of them arise from clinical settings that might not indicate the true nature of the problem in the community at large. Large scale community-based study is essential to provide policy makers with comprehensive and relevant evidences on violence against pregnant women for improving their wellbeing. This study was initiated to investigate the prevalence and associated factors of IPVP in the community of Kersa and Harar Health and Demographic Surveillance System (HDSS) sites in Eastern Ethiopia

Approaches and Results

The study was conducted from January to October 2018 among married women aged 15-49 years living with their husbands at least during the index pregnancy who were in their sixth week after giving live birth. A total of 3015 women participated in the study of which 30.5% (95% CI: 28.8, 32.1) reported at least one type of IPVP (i.e. psychological, physical or sexual). The psychological IPVP was the most frequent (24.4%), followed by physical (11.9%) and sexual IPVP (11.0%). Among women experiencing physical IPVP, 7.9% reported that the violence was moderate whereas 4% stated that it was severe.

The most frequent overlapping IPVP experience was physical and psychological (9.3%), followed by psychological and sexual (7.1%), and physical and sexual IPVP (4.6%). The joint occurrence of all types of IPVP was 4.0%. Physical violence was less likely to occur in isolated form (2.1%) when compared to sexual (3.3%) and psychological violence (12.0%) (Figure1).

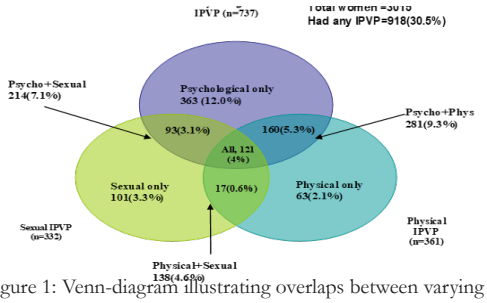

Figure 1: Venn-diagram illustrating overlaps between varying types of Intimate Partner Violence during Pregnancy in Eastern Ethiopia, 2018

Women earning cash in a payable job, being in the age of 20-34 years, having discordant intentions of the pregnancy with their intimate partner and the intimate partner being habitual khat chewer were associated with any of the IPVP in the study community. On the other hand, factors associated with decreased prevalence of IPVP included women being educated, taking no alcohol, living in an extended family arrangement, experiencing previous loss of infant and the partner being unemployed.

Policy recommendation

- Empowering primary health care providers (health extension workers) through training and refresher courses about IPVP in general and referral links is essential to appropriate care providers.
- Early intervention through screening of IPV in the antenatal care (ANC) setting as well as during home visits is recommended for reducing gender-based violence in the community
- Men should be encouraged to participate in the maternal and child health (MCH) programs, and be counseled on safe motherhood as one strategy for promoting pregnant women's sexual autonomy and reduce IPVP.
- Local authorities, relevant offices and civic societies operating in the area of women's rights should promote safe motherhood and intervene towards reducing IPVP.

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POLICY BRIEF 3-1 | THEME | III
May 2021

Mobile-Based Multilingual Expert System for Cattle Disease Diagnosis and Treatment

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Key messages

•A mobile-based multilingual expert system for cattle disease diagnosis and drug recommender application was found a promising technology that helps experts and farmers to monitor cattle disease and diagnosis at an early stage and provide appropriate treatment.

Introduction

Ethiopia takes the major livestock population in Africa, in which livestock plays a substantial role in the Ethiopian GDP through exporting of live animals and skins, which profits the country with foreign exchanges. It is estimated that 70% of the overall population has a very common cattle asset, and their livelihood relies on that. Ethiopian central statics agency survey estimated the cattle population of the country is found to be 65.35 million. Cattle by-products such as milk, meat, and butter also enhance the nutritional status of the people. Despite having this high livestock population, the economic advantage from cattle fluctuates from year to year due to factors like disease, animal mortality, and healthy standards (lack of veterinarians). Particularly, animal diseases have different undesirable influences on cattle production, including animal death, weight loss, growth retardation, poor fertility among others. Drug Administration and Control Authority of Ethiopia categorizes cattle diseases into the infectious, non-infectious, respiratory, reproductive, plant, and chemical poisoning diseases. The most common diseases affecting cattle production and productivity are mastitis, lumpy skin, blackleg, foot-and-mouth, brucellosis, internal and external parasites and anthrax. Poor healthcare management practice and shortage of veterinarians are also other challenges of cattle production and productivity. These challenges necessitate technologies that complement the veterinary professionals to diagnose the disease for timely response to improve animal health and productivity. This study is, therefore, intended to develop multilingual mobile application system for animal disease diagnosis and appropriate treatment.

Approaches and Results

In this study, the design science research method was used. This method follows knowledge acquisition, modelling, and representation (Figure 1). Finally, expert system design and evaluation of mobile-based multilingual systems were developed.types of IPVP was 4.0%. Physical violence was less likely to occur in isolated form (2.1%) when compared to sexual (3.3%) and psychological violence (12.0%) (Figure1).

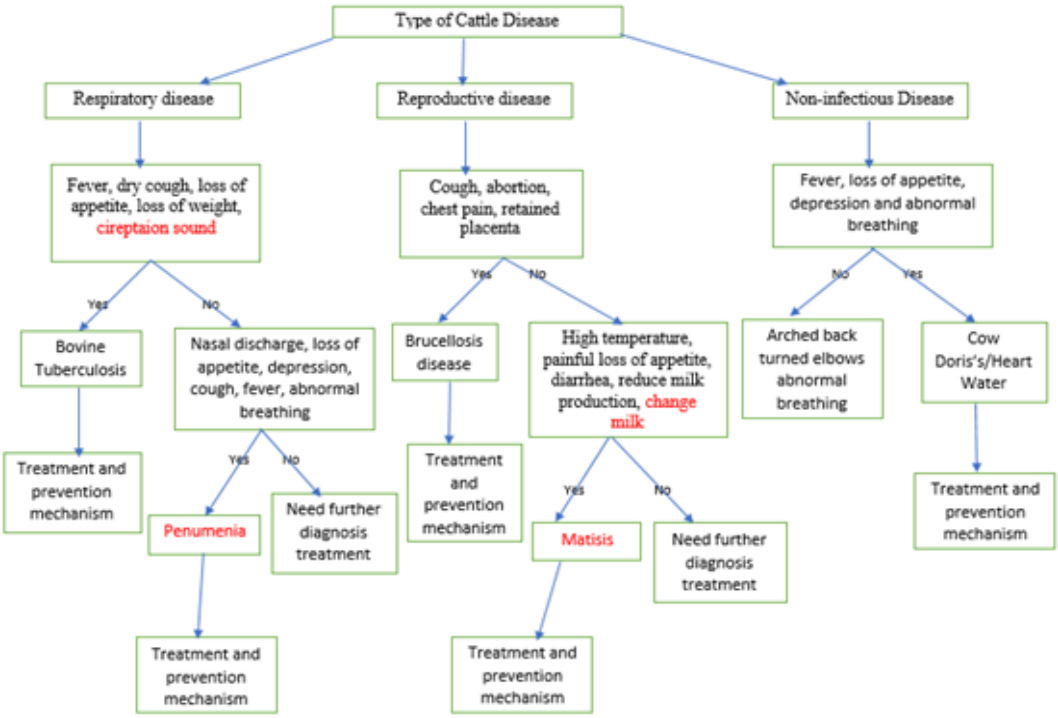

Figure 1. Decision Trees for Diagnosis and Treatment of major types of cattle disease (respiratory, reproductive & non-infectious diseases).

Key messages

User acceptance testing of the developed prototype system was tested by end-users, including Veterinarian Medicine Doctors (VMDs) and animal health professionals from Haramaya University and the Ethiopian Institute of Agricultural Research.

The average user acceptance rate of 20 domain experts selected purposively to test and evaluate a prototype system was 4.79 on five Likert scales. The final result indicates that 95.8% of end-users are satisfied by the performance of the expert system. The prototype system is multilingual, easy to use, time- and cost-effective, and complement experts, increase demand satisfaction, can be used anywhere, and improve domain experts and end-users confirmed the animal health service status and the same.

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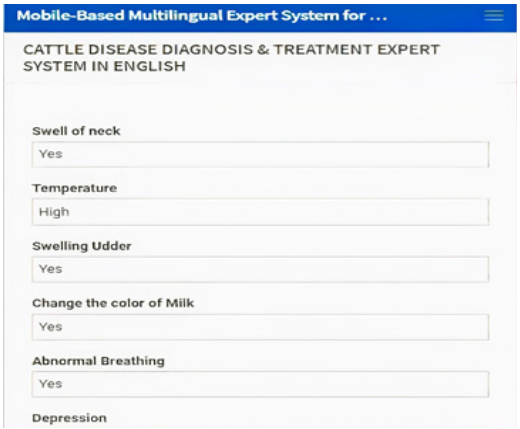
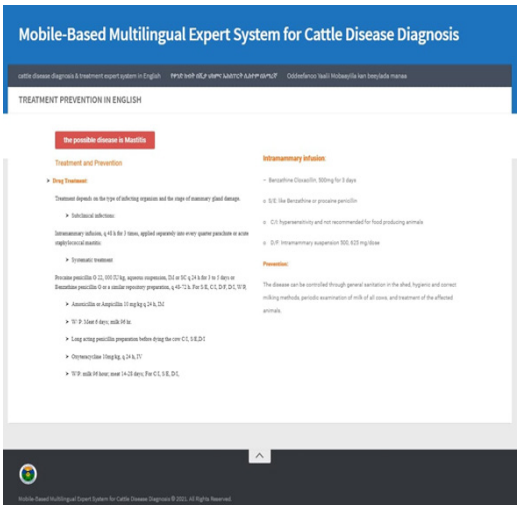
System Performance Testing using Test Cases

System performance tests were conducted using disease profile datasets collected from the Ethiopian Institute of Agricultural Research (EIAR), Deberezeyit Agricultural Research Center (DARC), and Haramaya University (HrU). The samples include 22 attributes with their respective values. The test cases, which are unlabeled disease samples, are delivered by domain eperts to label as Haemorrhagic septicemia, Foot Mouse Disease (FDM), Lumpy Skin Disease

(LSD), Blackleg, Anthrax, Rift Valley fever, Internal Parasite, Enteritis Mastitis, Brucellosis, pneumonia, bovine Tuberculosis (TB), Bluetongue and Cowdriosis/Heartwater. Considering the number of attributes and the time it consumes to label it manually, the researchers prepared only 149 test cases/instances for system performance testing. The system evaluators carried out the testing procedures to classify the test cases as correctly diagnosed or incorrectly diagnosed and compared the decision made by the system with that of the expert's decision on the cases. They validated the number of correct decisions made by the expert system. The system has correctly diagnosed or identifiec 93.4 (17 test instances/182 samples) with acce able liagn stic accuracy to their correct class. Th dev lope mobile application is shown in Figure 2





Policy recommendation

- Mobile-based multilingual expert system for cattle disease diagnosis and drug recommender application has to be scaled-up to address the wider community for monitoring and early alerting of farmers and experts for decision making.

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POLICY BRIEF 4-1 | THEME | IV
May 2021

Agricultural population undermines the importance of the segregated occupational groups in Hararge, Ethiopia.

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Key messages

•Occupational groups like smiths, tanners, potters and weavers make up significant minorities among the Hararge population. These social groups were also socially segregated against and their economic benefit from their skill is not commensurate with **their contribution.**

Introduction

Many African majority populations have kept low-caste occupational minority groups under their domination. The low-caste occupational groups engage in production of items that are essential for agricultural, pastoral rural societies and urban dwellers rendering indispensable services. In addition to benefiting greatly from their products, the occupational groups have played important roles in the maintenance and improvement of different traditional technologies that other communities utilize. However, these groups of people have experienced a very low social status and suffered discrimination in the society. It is assumed that low-caste occupational minorities evolved or originated first as remnants of ancient submerged groups or peoples unable to assimilate into dominant populations. On the other hand, David Todd maintained that low-caste groups were formed because of a social standing constructed on occupational social stratification and specialization. This study was conducted to identify the segregated social groups, their working and living conditions in the Eastern Ethiopia.

Approaches and Results

This study was qualitative research, and focused on the lives and craftworks of individual artisans, and tries to reveal the issues of marginalization. The target population of this study were groups who are engaged in smithing, weaving, pottery making and tanning.

The study adopted historical and ethnographic approaches including survey of occupational groups living in West and East Hararge villages. In-depth interview of eleven key informants who are engaged in these activities were considered. To privilege the position of occupational groups, interview was held with thirty individuals from each minority group along with their children. Informants from non-occupational groups in the surrounding community were also interviewed. Informants are selected based on availability sampling on the basis of prior information from interlocutors who suggested having rich information. In addition, four focus group discussions comprising six to eight individuals were made in the selected sites.

To study marginalization issue, we have adopted the perspective of the marginalized group. In order to keep the originality of communication, we have used labels attached to the marginalized groups such as Tumtu, Faqi, and shagni, which have derogatory connotations. Some of these terms are considered unacceptable and have sought to document the feelings of those involved and are considered significant than other preferred terms.

For this study, seven Woredas were selected purposively: four from East Hararge (Haramaya, Kombolcha, Garamulata and Qarsa) and three from West Hararge zones (Chiro, Gelemso and Hirna). From these Woredas, some villages where occupational groups are predominantly found were selected.

Figure 1. A blacksmith in his workshop (Kombolcha) Figure 2. A potter making Qibaba/mitad (circular traditional grid used for making Injera), Ganda Medicho,Chiro

Figure 2. Gurbota in Iffa Bate Kebele Haramaya Figure 4. Weaver and his product in Kombolcha market

Although these occupational groups have been assisting the livelihood of the community, such as agricultural activities, producing pottery products, and weaving products, they have been denied the commensurate social prestige among the dominant agricultural communities. Moreover, the dominant agricultural community has failed to grant them equal status which runs contrary to their (dominant agricultural community's) own belief that the occupational groups have the same identity with themselves. It is more probable that these occupational groups have an ancient origin with the autochthonous population who through time were assimilated to the dominant agricultural Oromo. Since identity is partly a social construction and can be negotiated, these occupational groups might have constructed their identity in line with the demands and criteria set by the Oromo in terms of language and other cultural practices.

It was only after 1975 land proclamation that these occupational groups got the right to have farmland (Negarit Gazetha Proclamation No. 31/1975) though they still supplement their living through pottery making. Moreover, the socio-economic position of occupational minorities was somehow better only during the Derg regime. Overall, the findings indicate that the value and importance of the group is undervalued and the group accorded low social status. Although the economic importance of professional minorities to society as a whole is enormous, the benefits and advantages of the group are insignificant.

Policy recommendation

•The paradoxical gap between occupational and majority agricultural groups should be narrowed down by the government at all levels,

•The government, non-government organizations and other stakeholders should organize and arrange all potential facilities (access to working premises, credit, market linkage, etc.) for these occupational groups to encourage cottage industry.

•A concerted effort should be made by all relevant government bodies, NGOs and the community at large to educate the mass on the values of traditional craft technology and its advantage to preserve and pass the knowledge over to the coming generation

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POLICY BRIEF 5-1 | THEME | V
May 2021

Unmasking Multidimensional Poverty in Eastern Ethiopia

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Key messages

•More than half of sampled households were found to be multidimensionally poor in multiple set of poverty deprivation indicators in three cities of Eastern Ethiopia. Significant Portion of the society (14.33%) is highly vulnerable to multidimensional poverty.

Introduction

Poverty of an individual or a household goes beyond the traditional metrics of income. It can manifest itself in multiple set of deprivation relating to health, nutrition, education, basic standards of living, employment, sanitation and other relevant dimensions of poverty. Poverty measurement tool can be adopted to fit national contexts and policy priorities; however, the income dimension of the measure should be the starting point. A comprehensive measure of poverty must ideally take into account the performance of an individual across multiple dimensions. In recent years there has been world-wide recognition of the importance of adapting a comprehensive measure of poverty that complement existing measure of monetary poverty. Any strategy or plan that attempts to alleviate poverty requires in-depth area-focused research. A better understanding of constraints, opportunities and predicting future vulnerability will pave the way for strategic reduction of urban poverty in the study areas. Therefore, the study aims to compute urban households' Multidimensional Poverty Index (MPI) and investigate vulnerability to multidimensional poverty in Eastern Ethiopia.

Approaches and Results

The study employed three dimensions of MPI measures, namely; health, education and living standard with ten indicators (Table 1). A total of 300 sample households were included in the study from Dire Dawa, Harar and Jigjiga cities using two stage random sampling techniques.

As can be seen from Table 2, 53% of the sampled households were MPI/ multidimensionally poor by head count as they were derived at least either in all the indicators of a single dimension or multiple set of deprivations based on the adjusted intensity of the dimensions (Table 2). On average, the poor household is deprived in 49% of the weighted indicators in the intensity of poverty.

For this study, seven Woredas were selected purposively: four from East Hararge (Haramaya, Kombolcha, Garamulata and Qarsa) and three from West Hararge zones (Chiro, Gelemso and Hirna). From these Woredas, some villages where occupational groups are predominantly found were selected.

Table 1: Contributions of indicator for MPI

Dimensions	Indicators	Censored head count	Weight	Contribution
Health	Nutrition	0.40	1/5	0.26
	Mortality	0.20	1/5	0.13
Education	Year of education	0.10	1/5	0.06
	Child School attendance	0.15	1/5	0.10
Living standard	Cooking fuel	0.49	1/18	0.11
	Sanitation	0.47	1/18	0.10
	Water	0.29	1/18	0.06
	Electricity	0.14	1/18	0.03
	Floor	0.42	1/18	0.09
	Asset	0.29	1/18	0.06

Source: Survey, 2016

This study revealed that 49% of the identified poor society exhibit the highest deprivation in cooking fuel and sanitation, followed by floor housing which accounts for more than 40%. The living standard and health dimensions also contributed 45% and 39%, respectively, to multidimensional poverty in the eastern corridor of the nation.

Nutrition, education, and mortality dimensions contributed 26%, 16%, and 13%, respectively to MPI. The child school attendance, cooking fuel, sanitation and flooring of the house each contributed nearly 10% to MPI.

During the study period (2016), 14.33 % of the sampled households are not multidimensionally poor yet results indicate that they are highly vulnerable to multidimensional poverty in the future if no proper measures were introduced or taken by governmental and non-governmental organizations.

Table 2: Poverty result

Indicator	Percentage
Poverty head count	0.53
Intensity of poverty	0.49
MPI	0.26
MPI vulnerable	0.14

Source: Own Survey (2016)

Table 3: Multidimensional poverty index of each city

Town	Poverty head count	Intensity of poverty	MPI
Jigjiga	0.59	0.53	0.31
Harar	0.53	0.46	0.24
Dire Dawa	0.47	0.47	0.22
Total	0.53	0.49	0.26

Source: Own Survey (2016)

Comparing poverty head count among the three cities, the highest percentage of multidimensionally poor household was recorded in Jigjiga city (59%) followed by Harar city (53%) which is equivalent to the average value of MPI of the study, while it was 47% for Dire Dawa city administration, which is below the average value (Table 3).

Policy recommendation

- Government should develop and/or adapt a national measure of multidimensional poverty that fits the nation's context and policy priorities.
- Governmental and non-governmental organizations should monitor and issue policy measures to address the overlapping deprivations (food, medical services, sanitation facilities, etc.) within and across groups in different parts of the country.
- It is essential to reduce the intensity of deprivations of the poor society by designing poverty reduction strategies.
- Relevant stakeholders need to take urgent measures to provide protection for multidimensionally vulnerable households.

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POLICY BRIEF 6-1 | THEME | VI
May 2021

Magnetized Spent Coffee Residue: A potential biosorbent for the extraction of zinc oxide nanoparticles from water

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Key messages

•Magnetized spent coffee residue (MSCR) prepared by co-precipitation of spent coffee residue with Fe3O4-NPs found a promising adsorbent to extract ZnO-NPs from different water samples (river, effluents, and tap water), which otherwise cause environmental pollution.

Introduction

Poverty of an individual or a household goes beyond the traditional metrics of income. It can manifest itself in multiple set of deprivation relating to health, nutrition, education, basic standards of living, employment, sanitation and other relevant dimensions of poverty. Poverty measurement tool can be adopted to fit national contexts and policy priorities; however, the income dimension of the measure should be the starting point. A comprehensive measure of poverty must ideally take into account the performance of an individual across multiple dimensions. In recent years there has been world-wide recognition of the importance of adapting a comprehensive measure of poverty that complement existing measure of monetary poverty. Any strategy or plan that attempts to alleviate poverty requires in-depth area-focused research. A better understanding of constraints, opportunities and predicting future vulnerability will pave the way for strategic reduction of urban poverty in the study areas. Therefore, the study aims to compute urban households' Multidimensional Poverty Index (MPI) and investigate vulnerability to multidimensional poverty in Eastern Ethiopia.

Approaches and Results

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For this study, seven Woredas were selected purposively: four from East Hararge (Haramaya, Kombolcha, Garamulata and Qarsa) and three from West Hararge zones (Chiro, Gelemso and Hirna). From these Woredas, some villages where occupational groups are predominantly found were selected.

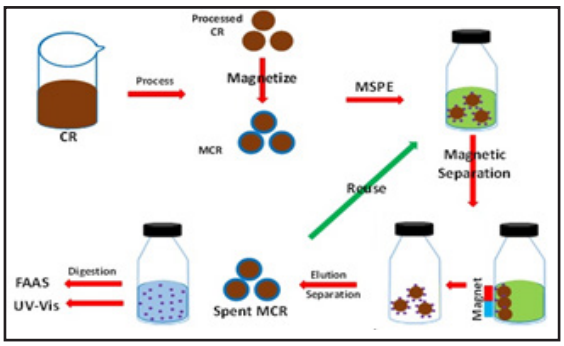

Figure 1 Schematic representation of magnetic coffee residue preparation and magnetic solid phase extraction of ZnO-NPs.

The characterization results indicated that effective magnetization of the coffee residue was achieved, and pure and spherical ZnO-NPs has been synthesized. Optimum conditions for the MSPE of ZnO-NPs were found to be 8.5 pH, 75 mg adsorbent, 120 min extraction time, 10 mL sample volume, 4 mL of 0.001 M HCl as eluting solvent, and 30 min elution time.

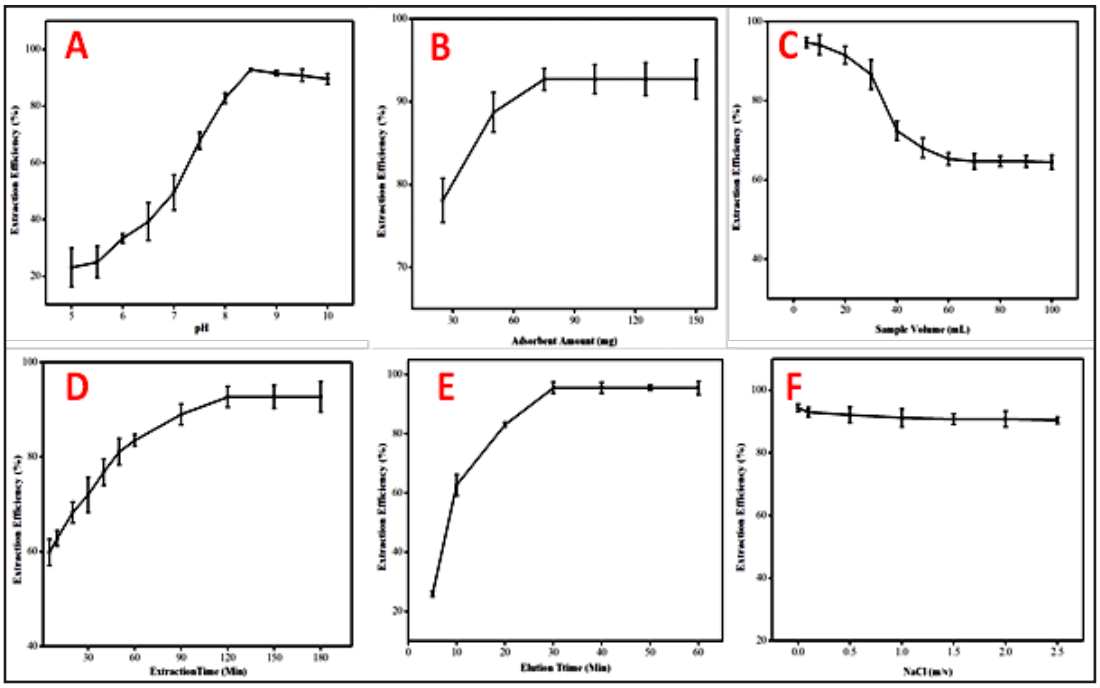

Figure 2. Effects of pH (A), adsorbent dosage (B), sample volume (C), extraction time (D), elution time (E), and ionic strength (F) on the MSPE of ZnO-NPs.

The selectivity of MSCR towards ZnO-NPs in the presence of Zn2+ was first studied by considering the capacity of MSCR to adsorb Zn2+.The MSCR was found to be selective to the ZnO-NPs in the presence of the most suspecting interference, and can also be recycled/reused at least for 6 types. Excellent analytical performances of the developed technique for the extraction of ZnO-NPs were observed with strong linearity (R2 = 0.994). Acceptable limits of detection (LOD) and limits of quantification (LOQ) of 0.12 and 0.4 mg/L were obtained, respectively. Likewise, the precise analytical data of the intra-day and inter-day relative standard deviation (RSD) were 1.4 and 2.2%, respectively.

The applicability and accuracy of the developed method for determination of ZnO-NPs in complex matrix such as environmental water samples (river, tap, and effluent) were evaluated by spiking experiment. Accordingly, the recovery (%) of ZnO-NPs from the spiked samples were between 93.0 and 98.2% (Table 2), which indicates that the developed technique is capable of determining trace ZnO-NPs in the water samples.

Table 1. Application of MSPE for the analysis of ZnO-NPs in the water samples (mean±SD, n=3).

Sample	Spiked (mg/L)	Detected (mg/L)	Extraction Efficiency (%)
	0	0	-
River	1	0.93±0.2	93.0
	5	4.70±0.4	93.8
Effluent from HrU	0	0	-
	1	4.80±0.2	96.4
	5	0.97±0.3	97.0
Effluent From Harar	0	0	-
	1	4.70±0.2	94.4
	5	0.95±0.2	95.0
Brewery Factory	0	0	-
Tap	1	0.94±0.2	94.0
	5	4.90±0.4	98.2

Policy Recommendations

- Stakeholders should be engaged in scale-out and promotion of the developed method for the extraction of zinc oxide nanoparticles from water and