

RESEARCH ARTICLE

PLASTIC BAGS - THREAT TO ENVIRONMENT AND CATTLE HEALTH: A RETROSPECTIVE STUDY FROM GONDAR CITY OF ETHIOPIA

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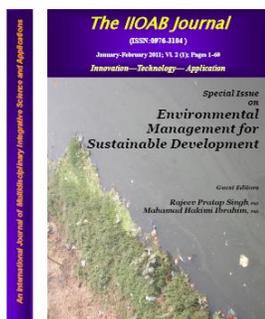
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Received on: 15th-Sept-2010; Revised on: 03rd-Nov-2010; Accepted on: 12th-Nov-2010; Published on: 5th-Jan-2011

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ABSTRACT



A retrospective study was conducted in Gondar city of Ethiopia for six years (2004/05 to 2009/10) to observe the impact of plastic bags usage on environment and cattle health. Paper packaging is vanishing slowly in the city and limited to small shops only. Open dumping of plastic bags containing wastes is observed commonly near road side, open plots, river side, in drains and public places however, it is prohibited under Ethiopian law. Winds carry bags to distant areas sometimes found entangled on the trees and shrubs create nuisance. During rainy season, the blockage of drains and overflowing of water was observed in some areas of the city. During study period, out of 711 rumenotomies done, in 111 (15.61%) and 600 (84.39%) animals, emergency rumenotomy and elective rumenotomy was performed, respectively. The quantity of the foreign bodies (FB's) collected from the rumen was ranging from 0.75 to 2.0 kg in 28 animals (3.94%); 2.0 to 5.0 kg in 116 animals (16.32%); 5.0 to 9.0 kg in 217 animals (30.52%) and above 9.0 kg in 350 animals (49.23%). Due to absence of plastic recycling unit in the Gondar city or in nearby areas, there is no practice of collecting and selling these products to junk dealers. Use of reusable bags made of cloths, jute and other natural fibers must be encouraged. In order to save the life of animals, residents should not pack and throw the food items in plastic bags. The cattle owners may be advised not to allow their cattle to freely wander in streets especially in the cities. They should see that the grazing lands are not polluted with the polythene and other wastes. Awareness may be created on careless disposal of plastic bags and as well as the periodical cleaning of these wastes in the grazing area.

Keywords: plastic bags; cattle health; environmental effects; rumenotomy; reuse; Gondar

[1] INTRODUCTION

Every year trillions of polythene bags are used in the World. They persist on this earth to haunt us and our generations for centuries. Polythene chokes the drains and the water bodies, pollutes the land and poisons us slowly but surely. Even mowed grass cannot escape the polythene menace [1]. Polythene has been recovered from the rumen of countless cattle and is a major threat to animals also. Polythene pollution is an epidemic now. Polythene is indestructible. One particle of polythene is further

made of many particles. If we continue to use polythene, the earth would become polluted on an alarming rate [2].

The word plastic has its origin from the Greek word “plastikos”, which means ‘able to be molded into different shapes’ [3]. They are made up of long chain polymeric molecules [4] and basic materials used for their manufacturing is extracted from oil, coal and natural gas [5]. Plastic or polythene bags commonly known as festal in Amharic language are in common use as shopping bags for packaging food, and other items in Gondar city as well as other parts of Ethiopia. In addition to polythene bags, plastics

are used in bottling of mineral water, cold drinks and liquid soap, which become part of waste after use. Majority of the residents collect their household wastes in plastic sacks and place them roadside on every Friday until it is carried away by private waste collectors in the city. Their better physical and chemical properties of being strong, light in weight, resistance to water and most water-borne microorganisms make them preferable choice over paper and reusable cloth and jute bags. Plastic consumption is growing at a rate of approximately 5% annually, and the global production reaching about 150 million tons per year [6].

After their entry to environment, plastics resist biodegradation and pollute for decades and centuries [7], and pose risk to human health and environment [8]. They are resistant to moisture, travel long distances because of their light weight, block drains during rains, and may also trap birds. Plastics cause “visible pollution” as they contribute to large volume of total municipal solid wastes and are major threat to air [9], oceans [10], soil [11], livestock [12,13], wildlife [14] and marine life [15]. Approximately, 95% of urban stray cattle in India are suffering from various ailments due to hazardous materials, mostly plastic bags inside their abdomen [13]. These plastics reduce the rain water percolation, affecting the ground water recharge and level. Soil fertility and seed germination is also affected when these plastic bags become part of manure and reaches agricultural fields. Presently there is no recycling unit of plastic bags in Gondar city so most of these plastics become part of municipal waste. As per literature survey limited work is done on this aspect in Ethiopia [16], so this study was designed to assess the impacts of plastic usage on environment and cattle health and to put forward some alternatives about plastic bags usage. The data obtained would be a baseline for the further research.

[II] MATERIALS AND METHODS

2.1. Study area

Gondar city, the capital of North Gondar zone in Amhara regional state, is located 750km North-west of capital city of Addis Ababa [Figure-1]. It is situated between 12°36'N and 33°28'E at an altitude of about 2300 m above mean sea level with an average temperature of 20°C and an average annual rainfall of 1800 mm. Being a highland area, the city is spread on different mountains, slopes and in valleys and has three small rivers, many streams and a lake. The city with a population of 186,077 [17], has 21 kebeles (wards), one hospital, three health stations, two health centers, one university, three veterinary clinics, four colleges, six secondary schools, one preparatory school (Senior Secondary School), one technical and vocational school, 27 primary schools, 13 kindergartens and an airport. The city has historical importance of being the capital of Ethiopia from 1635 to 1855 G.C. and has many medieval castles and churches.

2.2. Methodology

The retrospective study period was six years (2004/05 to 2009/10) and the data was collected by:

1. Personal observation.
2. Case study analysis i.e. by observation of cases registered under three veterinary clinics.

3. Key informant interview i.e. by conducting interviews of animal health assistants working in veterinary health service and private veterinary practitioners of Gondar city.
4. Transect walk observation.

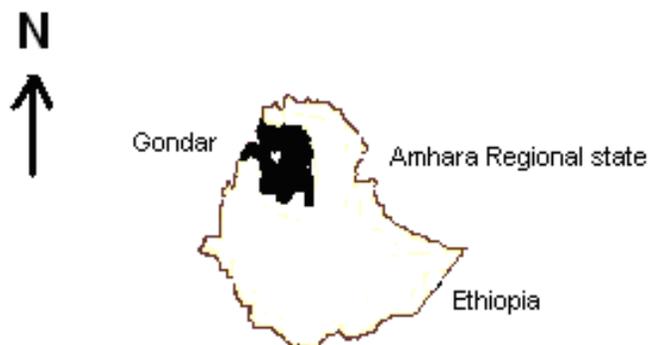


Fig: 1. Map of the study area

[III] RESULTS AND DISCUSSION

3.1. Increasing trend of plastic bags use

During the study period, authors observed an increasing trend of using plastic bags among Gondar city residents. A developing trend of “use and throw-away” towards these polythene bags is the main cause of the problem. During 2004-2008, shopkeepers sell these bags and provide the bags to those customers purchasing more items. The trend changed slowly and up to 2009, these plastic bags were given free of charge to shoppers. In some years residents of the city will be accustomed to plastic bags use that they find it difficult to change their habits. Paper packaging is vanishing slowly in the city and limited to small shops only. Locally made bags from big empty plastic sacks are in use on Saturday market day in the city but they are also losing their charm in the race of modernization. These plastic bags do not contribute much in terms of volume and weight to municipal solid waste (MSW), but the main problem is the disposal of these bags after use. Presence of used bags causes aesthetic disturbance of the city’s hilly landscape.

3.2. Current practices of plastic bags use and their environmental impacts

Open dumping of residential wastes including plastic is observed commonly in almost all wards of the city. Dumping is commonly observed near road side, open plots, river side, in drains and public places however, it is prohibited under Ethiopian law [18]. Residents used commonly plastic sacks and polythene bags for storing their wastes, which ultimately become part of MSW. From the temporary and final waste disposal sites, the stray and other domestic animals like cattle and donkeys engulf these plastic bags containing food materials inside. Sometimes the street boys were also found to sort large size and good quality

bags for their use. Winds carry away these bags to distant areas which were sometimes found entangled on the trees and shrubs and creates nuisance. During rainy season, the blockage of drains and overflowing of water was also observed in some areas of the city. Sometimes residents pack and throw the food items in the plastic bags. The stray and other animals were unable to open these bags and were found to consume whole plastic bags. In due course of time, the amount of plastic bags got accumulated in the stomach of these animals and create health problem for these animals. Intentional open burning of waste along with plastic bags is also a commonly observed practice in the city leading to problem of local air pollution with harmful gases.

As per the section 8 of Ethiopian Government Proclamation, passed in February 2007, any unlabeled plastic bag will be treated as unlawful and also bans the manufacture and import of plastic bags less than 0.03 mm in thickness [18]. Authors observed different colors of unlabelled plastic bags available and provided commonly in Gondar city, which are against the government law and need to be controlled.

3.3. Effects on cattle health

The plastic bags along with other foreign bodies in cattle affect the health and cause economic loss to the owner. The cattle have three non-glandular fore-stomach compartments - the rumen, reticulum and omasum. These are the sites for fermentative digestion. The fourth glandular compartment, the abomasum is the “true stomach” which is responsible for the next phase of enzymatic digestion. The indiscriminate eating habits and mineral deficiency make them susceptible to inadvertent ingestion of foreign materials [19, 20]. The various pathological conditions that are encountered due to ingestion of plastic and polythene materials in animals are indigestion, impaction, tympany, polybezoars, and immunosuppression [13]. The most common symptoms observed in the affected animal were bloat and were exhibited by the abnormal bulging of the paralumbar fossa on the left side of the abdominal wall. The other clinical symptoms were depression, complete or partial anorexia followed by loss of weight, ruminal impaction, reduction of milk yield, and suspended rumination. Milk and weight reduction in the affected animals was variable according to the stage of lactation, quantities of foreign bodies ingested and severity of the bloat. However accurate data in this regard was not maintained properly by the respective clinics. Acute bloat causes more pressure over the diaphragm and ribs which limits the respiratory movements, leading to hypoventilation and decreased venous return to the heart [19]. Lack of emergency and timely treatment of acute bloat may lead to cattle mortality. When the conservative line of treatment fails to correct these ailments of rumen, the only alternative is rumenotomy, which is surgically opening the rumen for treating its various ailments and to remove a variety of foreign bodies. A total of 711 rumenotomies were performed in the Gondar city area during the study period [Table- 1].

The bloat or tympanites may occur in different forms like acute, chronic recurrent, simple or frothy bloat. Out of the 711 rumenotomies done, in 111 (15.61%) and 600 (84.39%) animals, emergency rumenotomy and elective rumenotomy were performed, respectively. The ruminal tympany occurs during obstruction due to foreign bodies occluding the passage of eructing gases [26]. Farmers who could not arrange timely treatment used to lose their animals. The acute bloat was due to the complete obstruction of the rumino-reticular orifice and the ingesta could not be moved to the next compartment and the stasis resulted in accumulation of the fermented gas in the rumen.

In the cases of recurrent bloat the distension of the rumen reduced subsequent to conservative line of treatment. In these cases the obstructing foreign bodies were shifted to other parts of rumen resulting in temporary relief of bloat which recurred after few days. Ruminal impaction is due to the obstruction caused to the movement of the ingesta to the next compartment and it was noticed in 148 (20.83%) animals. It has been observed that cows with polythene materials in their stomach suffer from immunosuppression that leads to increased sensitivity to various infections [13].

Table: 1. Details of rumenotomies performed in the Gondar city during 2004-2010

Sl. No.	Place of surgery	Number of cattle operated
1.	Gondar university veterinary clinic	85
2.	Gondar woreda veterinary clinic	99
3.	Animal health assistants (private practice)	502
4.	Private veterinary clinic, Gondar	25
Total		711

Table: 2. The details of quantity of the foreign bodies (FB's) collected during rumenotomy

Sl. No	Quantities of FB's recovered (Kg)	No of animals	%
1.	0.75 - 2.0	28	3.94
2.	2.0 - 5.0	116	16.31
3.	5.0 - 9.0	217	30.52
4.	> 9.0	350	49.23
Total		711	100

The foreign bodies recovered by transruminal exploration during rumenotomy are broadly classified into penetrating (nails, wires) and non- penetrating foreign bodies (polythene bags, plastic materials, rubber articles, leather pieces, and cloths) as found in the cattle [Figure- 2 and - 3]. Other workers in different part of World encountered metallic objects [21], cloths [22] and polythene bags [23] in the gastrointestinal tract of ruminants, causing ruminal obstruction and occlusion. The foreign bodies were mostly dark black in color and their shapes modified into

ball-like and other shapes and their texture was also altered to be tougher than original. The above changes in foreign bodies were



Fig: 2. Large quantity of foreign bodies recovered after rumenotomy.



Fig: 3. Varieties of foreign bodies removed from a cow

due to churning action by the contraction of the rumen and reticulum and also by the action of the micro flora population inside. These large tight balls inside the rumen cause impaction. In some animals the churned up masses get fused together and make it difficult to remove through the rumenotomy opening and have to be cut into pieces and removed. The quantity of the foreign bodies collected from the rumen were ranging from 0.75 to 2.0 kg in 28 animals (3.94%); 2.0 to 5.0 kg in 116 animals (16.31%); 5.0 to 9.0 kg in 217 animals (30.52%) and > 9.0 kg in 350 animals (49.23%) [Table-2]. The items rarely recovered

were a small boy's trouser, belt and screw driver. In some unusual cases about 70% of the rumen was impacted with the foreign bodies. On exploratory rumenotomy twenty-two hair balls were recovered from the rumen and reticulum of a goat [24]. In an unusual case of rumenotomy in a cow revealed a large empty cement bag with its part embedded in the reticulo-omasal orifice obstructing the ingesta [25].

In all the cases the animals showed symptoms of pain exhibited by depression, arched back and grunting. Apart from this there was sudden drop in milk yield and 75% reduction was noticed incurring a heavy economic loss to the farmer. Losses or costs of several kinds occur like losses by death and by culling of bloat prone animals, losses of production from animals which suffer from bloat and survive, losses due to the disruption of normal farm work and management programs, losses due to the use of less productive but safer pastures, and the cost of preventive measures and treatment. Not measurable in monetary terms is the mental and physical strain on the farmer and his family when an outbreak occurs. Other costs those of research and extension services must be added [27].

3.4. Reuse and recycling

It's very difficult to impose complete ban on plastic bags use and plastic packing until there is fully equitable alternative available. The four R's as feasible options for achieving reduced material use and waste generation are Reduction, Reuse, Recycling and Recovery. Presently only reduce and reuse option are feasible in Gondar. As there are no recycling units for plastics in the Gondar city or in nearby areas, there is no practice of collecting and selling these products to junk dealers. However, the residents were found to reuse good quality of big size plastic bags. The reuse of these bags was observed among small shopkeepers and rural people, who sell vegetable in Saturday market. The residents had a good practice of reusing mineral water and cold drinks plastic bottles for pouring milk, oil, and "tella", a local beverage therefore contributing in reducing the amount of waste. In our previous study, the respondents were agreed to participate in segregating and storing the wastes provided there is some recycling unit which can buy their segregated wastes [28].

3.5. Options

Reusable bags made of cloths, jute and other natural fibers are durable, having long life span, biodegradable and above all environment friendly. Further reusable bags are washable, easy to carry and handle, will not break under the weight of heavy shopping items, reduce use of plastic bags, and do not pose a threat to environment and wildlife. Such types of bags are already in use in Addis Ababa, the capital city of Ethiopia and also seen occasionally in Gondar. Even plastic bags can be reused again and again so that threat to environment and life can be reduced. If possible we can refuse unnecessary packing of purchased item in plastics. In order to save the life of cattle, residents should not pack and throw the food items in plastic bags. The cattle owners may be advised not to allow their cattle

to freely wander in streets especially in the cities. They should see that the grazing lands are not polluted with the polythene and other wastes. Awareness may be created on careless disposal of plastic bags and as well as the periodical cleaning of these wastes in the grazing area. Creating awareness among city residents regarding indiscriminate use and disposal of plastic bags will be a good option to overcome the problem in future. The non-governmental organization named “SOS Addis Tefetron Bemalimat Bikletin Maswedged Mahiber” in Addis Ababa is engaged in generating awareness among Addis Ababa residents [29]; however such types of activities are needed in other parts of Ethiopia.

ACKNOWLEDGEMENT

Authors are thankful to Dr. Desalegne Mengesha, Vice President for Academic, Research and Community Service, University of Gondar, Dr. Hassen Kebede and Dr. Haileleul Negussie of the Unit of Clinical Studies and to Dr. Wudu Tamasgan, Dean, Faculty of Veterinary Medicine, University of Gondar for their help and constant support.

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