RESEARCH ARTICLE

OUTBREAK INVESTIGATION OF EPIDEMIC DROPSY IN PANCHMAHAL DISTRICT OF GUJARAT, 2012

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ABSTRACT

Background: Epidemic dropsy is food born disease. The etiological agent responsible for epidemic dropsy is sanguinarine and found in seeds of argemone mexicana. Epidemic dropsy has been reported from time to time in various parts of India. This outbreak of epidemic dropsy was reported in Panchmahal district of Gujarat in 2012.

Aims & Objective: (1) To identify etiological agent, source of outbreak and mode of transmission; (2) To propose control measures based on the outbreak investigation.

Material and Methods: A community based cross section study in Dholkhakhara village was carried out by rapid response team (RRT) of medical college Vadodara. Data was collected through (1) In-depth interview of cases. (2) Case records from government and private health facilities provided health services to dropsy cases. (3) A house to house survey of Dholkhakhara village.

Results: Attack rate of epidemic dropsy was 9.12 per 1000 population. Highest attack rate was 19.46 per 1000 population in 11-20 years of age group. Case fatality rate was 7.69%.

Conclusion: It was sudden onset; common source outbreak of epidemic dropsy. Cause of outbreak was ingestion of contaminated mustard oil with poppy seeds (argemone mexicana).

Key-Words: Argemone Mexicana; Case Fatality Rate; Dropsy; Outbreak

Introduction

Epidemic dropsy is food born disease which is defined as "a disease, usually either infectious or toxic in nature, caused by agents that enter the body through the ingestion of food".[1] Epidemic dropsy is classified under category of other specified noxious substances eaten as food (T.62.8) as per ICD 10 (international classification of disease 10). The etiological agent responsible for epidemic dropsy is sanguinarine, alkaloid in nature and found in seeds of argemone mexicana.[2-5] Seeds of argemone mexicana and mustard seeds are almost similar in external appearance cause accidental mixing of both seeds. Intentional adulteration of mustard oil with argemone mexicana seeds oil cannot be ruled out. Food adulteration is also common practice in India even though having Prevention of Food Adulteration Act (PFA).

Mukerjee et al isolated a toxic substance from Argemone oil in 1941, with an empirical formula C20H15NO4 that was later identified as sanguinarine.[5] Sarkar et al in 1948 reported the presence of at least two toxic alkaloids, sanguinarine and dihydrosanguinarine.[6]

Epidemic dropsy has been reported from time to time in various parts of India. First case of epidemic dropsy reported in1877 in Kolkata of West Bengal.[7] In the India most severe outbreak of epidemic dropsy was reported in New Delhi in 1998 where 65 deaths occurred.[8] Sudden clustering of cases having bilateral pedal edema with dysponea on exertion, diarrhea, vomiting and fever was reported in Dholkhakhara village of Panchmahal district of Gujarat state. One mortality was reported by district health authority. Chief district health officer requested the dean of medical college Vadodara for technical assistance and to carry out epidemic investigation. Outbreak investigation was carried out by rapid response team formed by dean of medical college Vadodara.

Materials and Methods

Clustering of cases having bilateral pedal edema with dyspnoea on exertion, diarrhea, vomiting and

fever in Dholkhakhara village were reported to district health officer of Panchmahal district. Outbreak of epidemic dropsy was suspected as per primary investigation carried out by district health team. Chief district health officer requested the dean of medical college Vadodara to carry out epidemic investigation for epidemic dropsy in Panchmahal district. A rapid response team (RRT) was formed by dean medical college Vadodara consisted of assistant professor from community medicine, microbiology and medicine department and paramedical staff. RRT along with district health officials reached to Dholkhakhara village and collected primary information about suspected cases. The diagnosis must be considered during an outbreak of bilaterally symmetric edema in more than one member of a family or community consuming mustard oil, especially if peripheral tendon jerks are well preserved and other causes of edema have been ruled out.[13] Thus, based on all these parameters probable diagnosis of epidemic dropsy was considered for investigation.

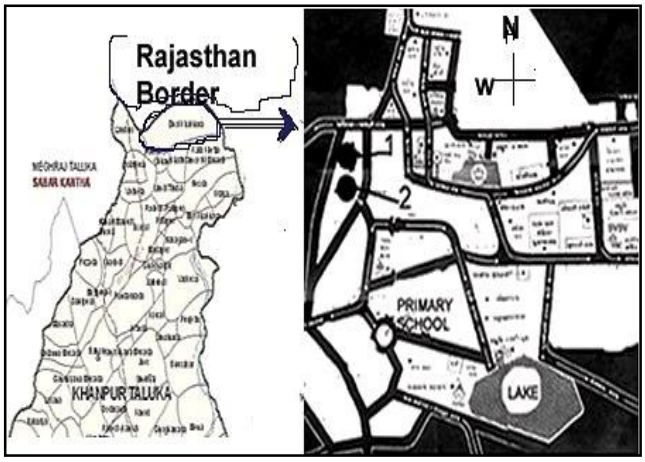

Figure-1: Map of Dholkhakhara village Showing Clustering of Cases. (Map not according to scale). 1 and 2 numbers shows clustering of epidemic dropsy cases

A meeting with gram panchayat members and health staff of Pandarvada PHC staff was arranged to get information about geography and demography of village, procurement of grocery specifically edible oil, past history of similar disease in village. Map of Dholkhakhara village was obtained and used for house to house survey to identify clustering of cases and to get place wise distribution of suspected cases of disease under epidemic investigation.

Study Area: Location of Dholkhakhara village played very crucial role in purchase of grocery from neighboring state Rajasthan. Dholkhakhara village is situated in Khanpur taluka of Panchmahal district. It is surrounded by district Sabarkantha with its northwest side about 10 km away and neighboring state Rajasthan (district – Dungarpur) with its northeast side about 10-15 km away. Total population of village is about 1667 including 892 male and 775 female populations. Majority of population is tribal population and primarily depend upon agriculture and animal husbandry for income.

Type of Study: A community based cross sectional study was carried out for investigation of epidemic dropsy in Panchmahal district.

Data Collection: Data was collected through (1) In-depth interview of cases. (2) Case records from government and private health facilities provided health services to dropsy cases. (3) A house to house survey of Dholkhakhara village. A rapid house to house survey of Dholkhakhara village was carried out with district and PHC health staff. Information regarding date of onset of symptoms, sex, age, place of residence, duration of illness, index case, food consumption etc was collected. Total 13 members of two families were affected by disease under epidemic investigation. Detailed history of food consumption, purchase history of grocery specifically edible oil, cooking method was also collected. Through detailed food history it was revealed that both families had purchased oil in within last one week from Pith village of Dungarpur district of Rajasthan which is just 8 to 10 km away from Dholkhakhara village. Detailed history of food consumption was also taken from those families gave history of food consumption from affected families. Suspected cases were subjected to thoroughly clinical examination and laboratory investigation for further confirmation. Data was subjected to time, place and person wise analysis. Data was analyzed using microsoft excel and Epi Info 3.4.3 version.

Sample Collection: Oil samples from both families were taken and sent to assistant commissioner, department of food and drug, Godhara, Panchmahal for further testing. Blood samples of all affected persons were collected by medical officer of Pandarvada primary health centre. Water samples from common water source

and each household of village were tested for chlorine. Entomological survey was carried out by district health officers.

Report: Epidemic investigation report was submitted to the dean medical college Vadodara and chief district health officer Panchmahal district.

Results

Total 13 cases of epidemic dropsy from two different families of Dholkhakhara were reported. Data were subjected to time, place and person wise distribution. Index case of epidemic dropsy was reported on 21st September 2012 and followed by remaining cases. Epidemic curve was plotted based on date of onset of new cases showed single peak epidemic without any secondary wave suggestive of common source epidemic. Outbreak was limited to members of two families who consumed edible oil purchased from common oil miller in Pith area of Rajasthan state. Attack rate of dropsy was 9.12 per 1000 population. Highest attack rate was 19.46 per 1000 population in 11-20 years of age group followed by 12 per 1000 population in 21-30 years of age group. There was no any case of epidemic dropsy below age of 5 years and age group of 31-40 years reported. Case fatality rate was 7.69%.

The common signs and symptoms included bilateral non inflammatory edema of lower limbs (100%), diarrhea (100%), abdominal pain (100%), vomiting (100%), fever (84.62%) and dyspnoea on exertion (61.54%). Diarrhea, vomiting and abdominal pain were the reported first followed by bilateral pedal edema and later on dyspnoea on exertion by all cases. Uniform pattern of development of sign and symptoms was noted in all cases. Initially both the families consulted traditional faith healer for treatment. Three male and one female cases consulted government health facilities (initially at PHC Pandarvada and later on at CHC) for diagnosis and treatment. One male person of affected family became very critical was admitted to private hospital. After two days of admission at private hospital he was died.

Table-2: Distribution of Epidemic Dropsy Cases by Clinical Features (N=13)

Clinical Features		N	%
Edema	Lower Limb	13	100
	Generalized	6	46.15
Gastro-intestinal	Diarrhea	13	100
	Abdominal pain	13	100
	Nausea	13	100
	Vomiting	13	100
Constitutional	Fever	11	84.62
	Malaise	13	100
	Prostration	13	100
Cardiovascular	Exertion Dyspnea	8	61.54
	Persistent Tachycardia	6	46.15
	Raised JVP	2	15.38
	Congestive cardiac failure	6	46.15
Respiratory	Cough	5	38.46
	Decrease air entry	2	15.38
	Bilateral crepitations	5	38.46
Pallor		5	38.46
Ocular	Irritation or Burning sensation	3	23.08
Renal	Decrease urine output	4	30.77
Cutaneous	Tenderness	2	15.38
	Erythema	3	23.08
	Warmth	2	15.38

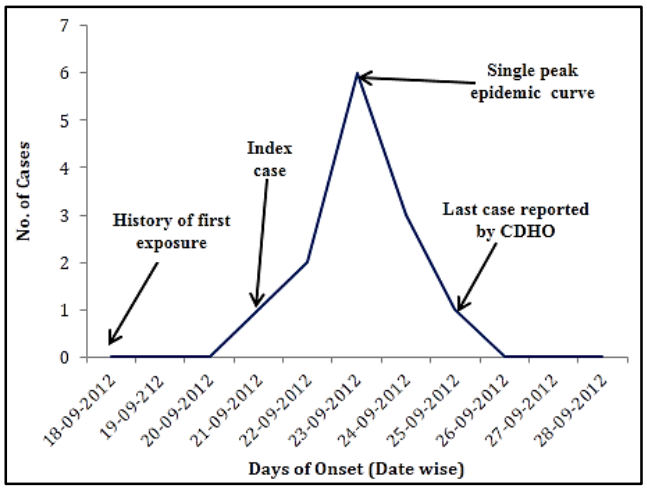

Figure-2: Distribution of New Cases of Epidemic Dropsy by the Date of Onset

Table-1: Age and Sex Specific Attack Rate of Epidemic Dropsy

Age Group (years)	Male	Population at risk	Attack Rate (per 1000 population)	Female	Population at risk	Attack Rate (per 1000 population)	Total	Total Population at risk	Attack Rate (per 1000 population)
1-10	0	64	0.00	1	52	19.23	1	116	8.62
11-20	4	125	32.00	1	132	7.58	5	257	19.46
21-30	2	132	15.15	1	118	8.47	3	250	12.00
31-40	0	162	0.00	0	148	0.00	0	310	0.00
41-50	1	141	7.09	1	123	8.13	2	264	7.58
≥51	1	98	10.20	1	131	7.63	2	229	8.73
Total	**8**	**722**	**11.08**	**5**	**704**	**7.10**	**13**	**1426**	**9.12**

Discussion

The dropsy case was first reported by Lyon in Calcutta in 1877 and then has been reported from time to time in India.[7] This outbreak of dropsy was reported in Panchmahal district of Gujarat in 2012. Chief district health officer of Panchmahal district was informed about clustering of cases having bilateral pedal edema with dyspnoea on exertion, diarrhea, vomiting and fever in Dholkhakhara village by medical officer of Pandarvada PHC. An outbreak of epidemic dropsy was suspected as per primary investigation. Suspected cases were referred to medical college and SSG hospital Vadodara for further diagnosis and treatment.

Total 13 cases of epidemic dropsy including one death were reported by rapid response team of medical college. Index case of epidemic dropsy was reported on 21st September 2012 by epidemic medical officer of Panchmahal district. All other cases were reported during 21st September to 25th September 2012. Symptoms developed after consumption of mustard oil which was common source for disease under investigation. Symptoms developed in affected persons were of sudden onset with single peak and no any secondary case was reported suggestive of point source epidemic and probable cause was consumption of mustard oil with possibility of adulteration with argemone oil. All 13 cases were from two families of Dholkhakhara village. Both families gave history of consumption of mustard oil purchased from common oil miller of Pith area of neighboring state Rajasthan which was 8-10 Km distance from village. Adulteration of various oils with argemone mexicana was reported by other authors.[9-12] It is well established that etiological agent responsible for epidemic dropsy is sanguinarine found in seeds of argemone mexicana.[2-5]

This outbreak was reported in month of September 2012. Outbreak of epidemic dropsy usually occurs between the months of May and November.[7] The color, shape and size of argemone mexicana seeds are similar to that of the dark colored mustard seeds. Distribution of these new crops in market starts from April month so most epidemics were reported during this season.[2,3] It was noted during investigation that both families were aware about adulteration practice of edible oil by oil miller. Even though most of villagers preferred to purchase oil from that oil miller because of cheaper price (almost 30-50% less from market price) offered by oil miller, easy accessibility in compare to other nearest market places of Gujarat and convenient payment system offered by oil miller.

In present study both the affected families had shown the tendency of using mustard oil for cooking food that was purchased loose from the open market in first week of September 2012. Thus they became the easy victims of adulterated oil supplied loose by oil miller. Similar tendencies were reported in families of affected patients in other epidemic investigations carried out in the country.[2,13]

In present study attack rate of dropsy was 9.12 per 1000 population. It was noted that age specific attack rate was highest in the age group of 11-20 years. No any case below 5 years of age group was reported. Similar findings were noted by others.[2,13,14] It was explained by hypothesis that infant and young children did not consume food cooked in mustard oil or if they consumed, they consumed in such a small quantity that did not develop sign symptoms of dropsy.

Bilateral non inflammatory pedal edema was the constant feature and reported in all cases in present investigation and remained for longer duration of illness. Active toxic principle sanguinarine has been shown to produce widespread capillary dilation coupled with increased capillary permeability, and produces clinical features similar to epidemic dropsy under experimental conditions.[15] It primarily acts on the blood vessels following which multiple systems are affected leading to a wide spectrum of clinical features. Persons of all ages and both sexes who consume the contaminated oil are equally affected.[15] Similar findings were also reported in other studies carried out in India.[2,13]

The diarrhea and vomiting observed in the acute stage may be due to direct toxicity of *Argemone* oil to the enterocytes and congestion of the gut mucosa due to vascular leakiness.[7] Onset is usually sub-acute or insidious with watery

diarrhea and vomiting. This lasts from a few days to more than a week. In a few outbreaks diarrhea was not a common feature at the outset but it usually precedes the onset of edema. Gastrointestinal disturbances at onset have been reported by various investigators in 52–80% of cases.[7]

Affected family members consulted traditional faith healer for treatment and later on primary and secondary level government and private health facilities where diagnosis of disease was not made and treated for symptomatic relief. One affected person died of cardiac failure. Death due to cardiac and respiratory failure also reported by other authors.[7] Case fatality rate was 7.69%. The similar findings were reported in earlier studies which reported a mortality of 3-7%.[12] As in present study villagers gave information about few deaths of cases with similar sign and symptoms in Pith area of Rajasthan state due to adulterated mustard oil consumption. RRT could not confirm or access data regarding information due to poor coordination with neighbouring state that was the limitation of present study.

Recommendations: Based on findings noted in outbreak investigation following suggestions were recommended:

- Immediately stop use of contaminated edible oil
- Strict ban on selling of adulterated edible oil from shop under suspicion
- Educate and awareness among people for hazards of adulteration
- Strict implementation Prevention of Food Adulteration (PFA) Act
- Good interstate health data exchange system particularly for state border areas.

Conclusion

It was sudden onset, common source outbreak of epidemic dropsy in Dholkhakhara village of Panchmahal district. Most likely cause of outbreak was ingestion of contaminated mustard oil with poppy seeds (argemone mexicana).

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