



**MEASLES EPIDEMICS IN TURKEY AND DEVELOPING COUNTRIES:
REVIEW OF THE LITERATURE**

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Abstract

In this study, the global extent of measles outbreaks were evaluated. We searched the reports of measles outbreaks that occurred between 1993 and 2002 in English published literature and data about measles morbidity and mortality rates of Turkey during 1970-2001. Thirty-five reports described outbreaks in a total of 19 middle or low income countries. In Turkey, 30509 measles cases and 18 associated deaths were reported in 2001. In the same year the morbidity rate was 44.97 per 100000 population and the mortality rate was 0.13 per million population. As a conclusion, measures to control measles outbreaks must include partnerships with local municipalities and international health, rapid identification and vaccination of groups at high risk (e.g. health-care workers, migrants, and tourist industry personnel), an additional dose at 6-9 months for Infants at high risk (HIV-infected, vitamin A deficient, in closed communities such as refugee camps, or in the face of an outbreak), house-to-house monitoring of vaccination coverage, heightened surveillance in all regions of the country.

Key words: Measles, Outbreaks, Immunization, Developing Countries

Introduction

In developing countries with a high level of infection, infants below the age of 12 months are at high risk for measles virus (MV) infection. Despite the widespread availability of measles vaccine for nearly 40 years, measles remains a major cause of childhood mortality. There were an estimated 30-40 million cases of measles in 2000, causing some 777 000 deaths (1).

Vaccination with an attenuated live virus vaccine has proven to induce protective immunity in seronegative individuals, and even low titers of neutralizing antibodies seem to be protective. In developing countries with a high level of infection, infants below the age of 12 months are at high risk for MV infection. In this age group passively transferred maternal immunoglobulins (Ig) pose a problem because declining maternal antibodies interfere with vaccine-induced seroconversion but do not protect against infection with wild-type MV (2-5).

The World Health Organization (WHO) has advocated that outbreak immunization only be undertaken in areas with either high routine immunization coverage and the capacity to respond immediately to epidemics, or where there is overwhelming political pressure to intervene (6-8).

In Turkey, the children are vaccinated against measles at nine months of age routinely. The goal numbered twenty-five of The National Health Politics Document published by The Ministry of Health in March 1993 was nationwide eradication of measles until 2005 (9), measles epidemics are still seen in our country causing hundreds of children deaths.

In this study, it was aimed to evaluate the measles morbidity and mortality rates of Turkey during 1970-2001 and extent of global measles outbreaks.

Material and Methods

This epidemiological study included data about measles morbidity and mortality rates of Turkey during 1970-2001, distribution of cases according to age and months in 2001 and reports of measles outbreaks that occurred between 1993 and 2002 in English published medline (PubMed).

Epidemiological data about measles rates of Turkey were obtained from web page of Turkish Ministry of Health available at www.saglik.gov.tr (10). We searched the pubmed for reports of measles outbreaks that occurred between 1993 and 2002 in English published literature (for measles AND outbreaks AND epidemics). We also searched WHO and Centers for Disease Control and Prevention (CDC) web pages and related journals (EPI Newsletter, Emerg Infect Dis, MMWR, Wkly Epidemiol Rec).

In this article, the term 'outbreak' is used to ensure consistency when referring to any increase in the occurrence of measles cases in a community above the number expected.

Results

Measles morbidity and mortality rates of Turkey during 1970-2001 were shown in Table 1. In Turkey, the morbidity rate was 44.97 per 100000 population and the mortality rate was 0.13 per million population in 2001. 30509 measles cases were reported in 2001, and 66.1% (n=20154) of them were seen between March and June (Figure 1).

The children were mostly in the 5-9 years age group (37.1%, n=11329) (Figure 2). The descriptive information of measles outbreaks seen in developing countries between 1993 and 2002 were given in Table 2.

**Figure 1. Cases of measles' distribution according to months in Turkey - 2001
(Turkish Ministry of Health-www.saglik.gov.tr).**

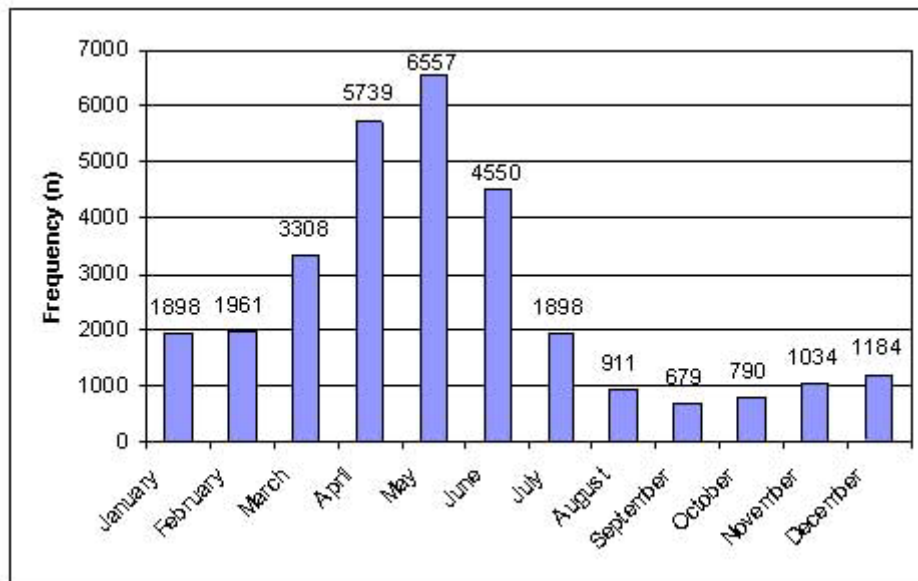


Table 1. Morbidity and Mortality Rate of measles in Turkey*, 1970-2001.

Years	Population (n)	Cases (n)	Morbidity Rate (100 000)	Mortality (n)	Mortality Rate (100000)
1970	35321000	46761	132,39	621	17,58
1971	36215000	43002	118,74	446	12,32
1972	37132000	23601	63,56	218	5,87
1973	38072000	43249	113,60	545	14,31
1974	39036000	12836	32,88	203	5,20
1975	40078000	24347	60,75	416	10,38
1976	40915000	21740	53,13	464	11,34
1977	41768000	16123	38,60	203	4,86
1978	42640000	12517	29,36	138	3,24
1979	43530000	11471	26,35	148	3,40
1980	44438000	8618	19,39	217	4,88
1981	45540000	26547	58,29	311	6,83
1982	46688000	8778	18,80	37	0,79
1983	47864000	31515	65,84	196	4,09
1984	49070000	30666	62,49	120	2,45
1985	50306000	14695	29,21	45	0,89
1986	51546000	2267	4,40	0	0,00
1987	52845000	2194	4,15	0	0,00
1988	54176000	9279	17,13	11	0,20
1989	57426316	19273	33,56	21	0,37
1990	57582446	11372	19,75	15	0,26
1991	57736288	22521	39,01	23	0,40
1992	59088101	24626	41,68	11	0,19
1993	60384474	34285	56,78	15	0,25
1994	61779288	23733	38,42	17	0,28
1995	63206510	13544	21,43	15	0,24
1996	62727000	27171	43,32	24	0,38
1997	63745000	22795	35,76	8	0,13
1998	64786000	27120	41,86	21	0,32
1999	65819000	16329	24,81	18	0,27
2000	66834000	16010	23,95	1	0,01
2001	67844903	30509	44,97	9	0,13

**Figure 2. Cases of measles' distribution according to age groups in Turkey-2001
(Turkish Ministry of Health Data-www.saglik.gov.tr).**

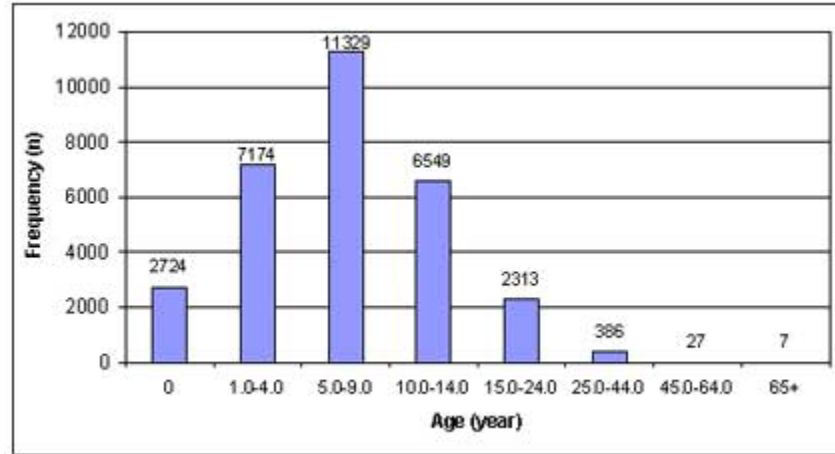


Table 2. Selected features of the measles outbreaks in developing countries.

Country	Dates of outbreak	Area of outbreak: population of area	Reported cases	Age range of cases	Diagnostic criteria
Chad 20	1993	N'Djamena: 530 965	19000	6 mos to >5 yrs	Clinical
Korea 21	1993	Seoul and Seong-nam city: NA*	380	<9 mos to >9 yrs	Laboratory
India 22	Jun-Jul 1996	Many districts in Uttar Pradesh: NA	6922	<9 mos to >5 yrs	Clinical
Alaska 23	Feb-Apr 1996	Juneau: 29288	63	6-18 yrs	Laboratory
Zimbabwe 24	Oct-Nov 1996	Mbare suburb of Harare: NA	294	9-35 mos	Clinical
Romania 25	Nov 1996-Jun 1998	Nationwide: 22.6 million	32915	<2 yrs - 14 yrs	Laboratory
Malawi 26	Nov 1996-Jun 1998	Blantyre city: 478 155	674	<1 yrs - 19 yrs	Clinical
Sudan 27	March 1997-July 1999	Suburban Khartoum: 500 000	>141	<9 mos - 14 yrs	Laboratory

India 28	Dec 1998-Feb 1999	Chandigarh Territory: NA	283	<15 yrs	Laboratory
Thailand 29	Sep-Oct 2000	Bangkok: NA	41	6 mos to >12 mos	Laboratory
Korea 30	March 2000-Jan 2001	Nationwide: 47.7 million	39537	<9 mos to >9 yrs	Laboratory
Turkey 15	Jan-Jul 2001	Sirnak Province: 353 000	1243	<9 mos to >10 yrs	Lab. & Clin.
Venezuela 31	Aug 2001-Jul 2002	Zulia, Falcon+14 States: NA	2416	<5 yrs - 24 yrs	Laboratory
Colombia 31	Jan-Jul 2002	19 Muni. Bordered Ven.:NA	68	<10 yrs - 29 yrs	Laboratory

* Not Available

Conclusion

WHO recommends that vaccination against measles normally be undertaken at the age of 9 months (11); however, It was considered that measles epidemics have occurred every 2 to 5 years in developing countries such as Turkey (Table 1). In this respect, during a measles epidemic, if a large proportion of cases occur in children below nine months (i.e., the attack rate for children <9 months is high), the age of measles immunization should be temporarily lowered to 6 months. Because of the lesser efficacy of the vaccine at this age, these children must be re-immunized as soon as possible after 9 months (11-13).

In Turkey, medical facilities are concentrated in the cities and larger towns, leaving most rural areas without adequate access to medical care. This situation is especially acute in eastern Anatolia, where medical care is generally available only in the provincial capitals (14).

In Turkey, 30.509 measles cases were reported in 2001 and 66.1% (n=20,154) of them were seen between March and June (Figure 1). The children were mostly in the 5-9 years age group (37.1%, n=11329) (Figure 2). These datas reveal that morbidity rate of 132 per 100 000 population and mortality rate of 18 per million population in 1970 decreased gradually by the years and reach to 45 per 100000 population and 0.13 per million population, respectively, in 2001 (Table 1), because of improving the protective health services and adding measles to routine vaccination schedule (10).

The recent measles outbreak in Turkey was reported from rural of Sirnak Province in southeast of Turkey (15). This outbreak began in January, 2001 in two settlements (Cizre and Idil counties of Sirnak province) nearby each other therefore intensive comings and goings seen between them. In Cizre, the index case applied to village clinic in 03 January

2001 while in Idil the first application was seen in 23 January. The peak application levels were observed at March and April in Cizre and at May in Idil. The course of the outbreak might have been effected from the personnels whose occupational places change frequently or from the excessive amount of health personnels working as temporarily. It is important that according to primary care clinic records, 7.4% of the suffered patients (n=39) were 0 to 9 months old children who hadn't been vaccinated yet (15). This ratio is in accordance with the findings of Ertem et al. (16) who determined that 6.7% of the sufferers were below 9 months at the measles outbreak occurred and 26.7% of the measles cases were vaccinated children in the center of Diyarbakir, Southeast of Turkey in 1996.

During the research of measles outbreak occurred in the region of Güzelbahçe village clinic of Izmir Province, Turkey in 1993, Ellidokuz et al. (17) determined that 68.6% of the measles cases aged 0 to 14 years had been vaccinated before. Mutlu et al. (18) searched the vaccination status of measles cases in Izmir and revealed their vaccination ratios by the years; according to these datas, in 1988, 49%, in 1989, 42%, in 1990, 41%, in 1991, 49%, in 1992, 48%, and in 1993, 57% of the cases had been vaccinated before. In recent outbreak, the vaccination status of the cases were 42.1% in Cizre and 13.5% in Idil (15). These are meaningful because of bringing up the insufficiency of the vaccine and the necessity for an argument about measles vaccination schedule. A high proportion of vaccine preventable cases in an outbreak would suggest that a failure to vaccinate children was a significant factor (11, 12).

Aylward et al. (19) reported that the literature searches and record reviews identified 301 reports of measles outbreaks that occurred between 1963 and 1995. Sixty-six reports described outbreaks in a total of 35 middle or low income countries. Seventeen measles outbreak reports described 13 separate immunization responses in 12 middle or low income countries (four outbreaks were reported in two articles or reports).

We searched the reports of measles outbreaks that occurred between 1993 and 2002 in English published medline. Thirty-five reports described outbreaks in a total of 19 middle or low income countries (Table 2) (20-37).

In 2001, the number of confirmed measles cases in the Region of the Americas reached a record low of 537 cases, a 99% decrease since 1990 (31, 34). During 2001, the Dominican Republic and Haiti interrupted indigenous measles transmission successfully (34,35), ending known indigenous transmission of the D6 measles virus genotype. This genotype, which had circulated widely in the Region of the Americas since 1995, caused nationwide outbreaks in Argentina, Bolivia, Brazil, the Dominican Republic, and Haiti during 1997-2001 (34-37). In August 2001, a measles outbreak introduced by a traveler returning from Europe occurred in Venezuela and was exported to Colombia in 2002 (31).

During 2001-2002, two outbreaks of measles occurred in Venezuelan states near the border with northern Colombia (measles vaccination coverage in these states was lower compared Venezuela General, e.g., Falcón, 44%; Zulia, 34% vs. 84%). The outbreak

spread to Colombia in January, 2001 and ended after implementation of a statewide vaccination campaign for children aged 1-14 years. During these outbreaks, measles surveillance has been heightened by using active case searches in both countries, with 2198 suspected cases detected (5.4 per 100000 population) in Colombia and 6380 (26.5) in Venezuela. The age groups most affected were children aged <5 years, children aged 5-9 years, and persons aged 20-29 years. Finally, editors concluded that low vaccination coverage in Venezuela and deficiencies in surveillance contributed to the outbreak (31).

As a conclusion, measures to control measles outbreaks must include 1) partnerships with local municipalities and international health organizations (e.g., WHO, UNICEF), 2) rapid identification and vaccination of groups at high risk (e.g., health-care workers, migrants, and tourist industry personnel), 3) an additional dose at 6-9 months for Infants at high risk (HIV-infected, vitamin A deficient, in closed communities such as refugee camps, or in the face of an outbreak), 4) house-to-house monitoring of vaccination coverage, 5) heightened surveillance in all regions of the endemic countries.

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