

EPIDEMIOLOGICAL CHARACTERISTICS OF MALARIA IN TURKEY (Turkey's Experience)

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1. Background

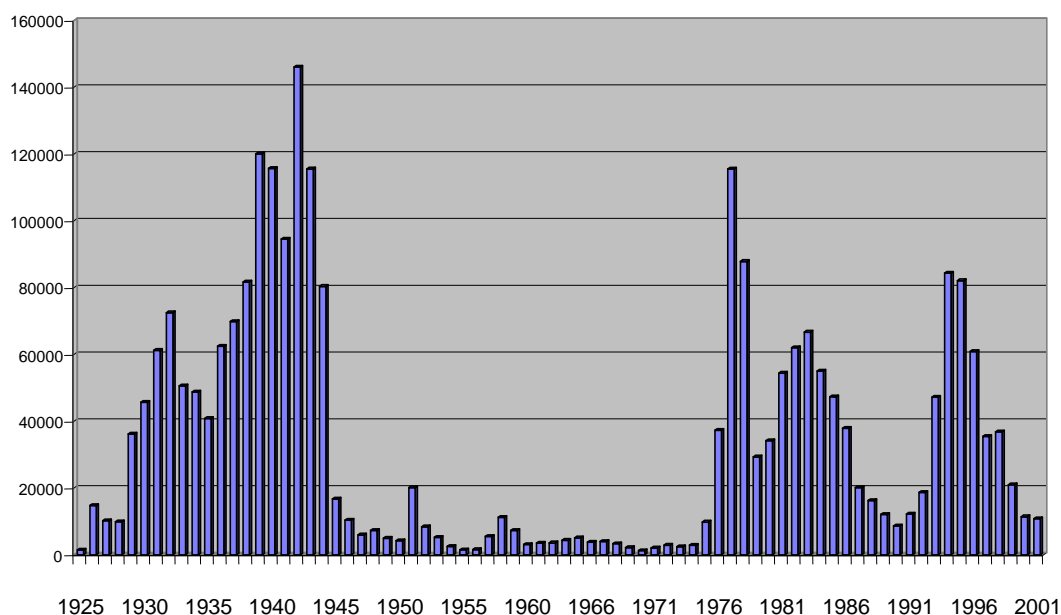
Malaria was a serious problem at Anatolia in the past. Some civilization vanished due to the malaria epidemics. We don't have a certain data, but we know that at the beginning of the twentieth century, more than %80 of the population suffered from malaria. When the Turkish Republic was founded, the most important health problems were malaria and tuberculosis. One of the main aims of the young government was to promote health status of the population, especially to control the malaria and tuberculosis. The government's efforts were in success; between 1945 -1970, malaria cases were brought under the control and the number of the cases was no more then 2000 (See Table 1, Chart 1).

Table 1: DISTRIBUTION OF MALARIA CASES BY YEAR IN TURKEY (1925-2001)

YEARS	NUMBER OF CASES	YEARS	NUMBER OF CASES	YEARS	NUMBER OF CASES
1925	1434	1951	20132	1977	115512
1926	14791	1952	8400	1978	87867
1927	10190	1953	5227	1979	29324
1928	9928	1954	2489	1980	34154
1929	36186	1955	1494	1981	54415
1930	45653	1956	1573	1982	62038
1931	61241	1957	5536	1983	66681
1932	72500	1958	11213	1984	55020
1933	50609	1959	7305	1985	47311
1934	48744	1960	3092	1986	37899
1935	40842	1961	3498	1987	20134
1936	62466	1962	3594	1988	16245
1937	69850	1963	4365	1989	12112
1938	81702	1964	5081	1990	8680
1939	120060	1965	4587	1991	12218
1940	115683	1966	3793	1992	18676
1941	94534	1967	3975	1993	47210
1942	146077	1968	3318	1994	84345
1943	115546	1969	2173	1995	82096
1944	80387	1970	1263	1996	60884
1945	16739	1971	2046	1997	35456
1946	10373	1972	2892	1998	36842
1947	5979	1973	2438	1999	20963
1948	7298	1974	2877	2000	11432
1949	4973	1975	9828	2001	10812
1950	4211	1976	37320		

Source: Ministry of Health

**Chart 1: DISTRIBUTION OF THE MALARIA CASES IN TURKEY
(1925-2001)**

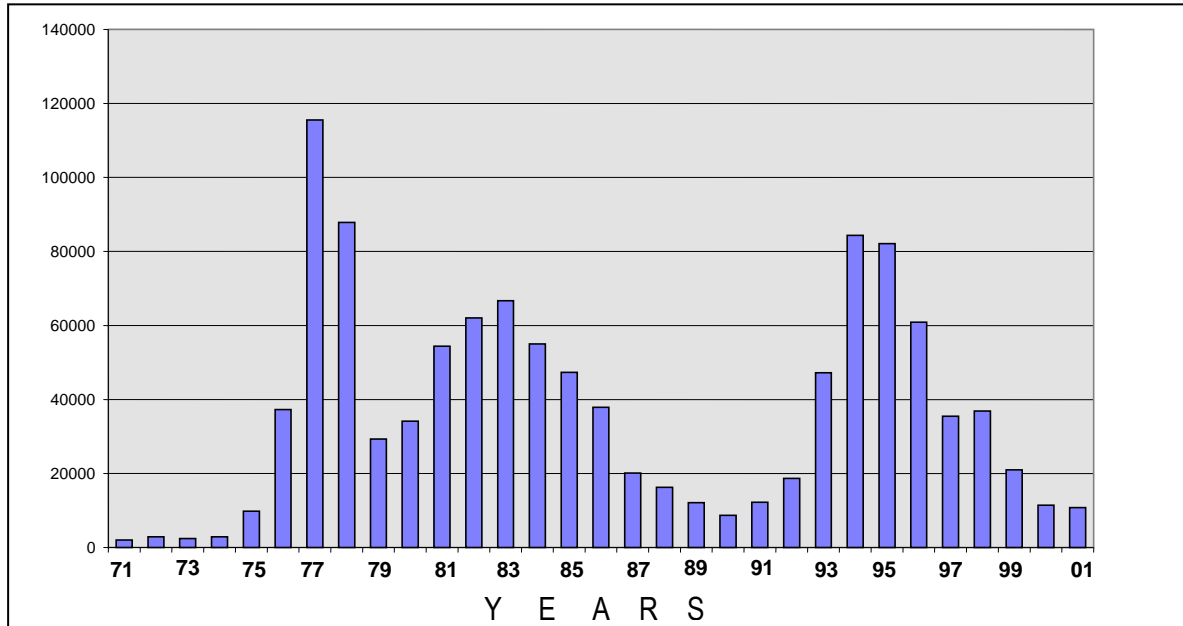


After 1970's, malaria control programs lost their importance and the government, especially Ministry of Health neglected to emphasize malaria services. The portion in the MOH budget for Malaria services was decreased; malaria personnel transferred to other services, health personnel forgot malaria and primary health care units no longer had a demand for malaria services. Thus, the malaria services weakened. As a consequence, the number of malaria cases has continuously increased since 1973, and in 1977 more than 115000 cases were reported. After this increase, some local focus instructed and Turkey had two epidemic attacks of malaria. The First attack peak was in 1977 and the second was in 1994 (see Chart 1, Chart 2). The Numbers of cases began to decrease in 1994 and decreased to 10832 in 2001.

There is a serious risk of malaria epidemics in Turkey due to presence of a parasitic reservoir in its own territory and at the southern border. Turkey has large population movements both ways in its territory and at the border. Every year, approximately 20 billion people travel in the country and most of them to the malaria area, especially Stratum I and Stratum II. Like this, every year, approximately 20 billion people across the border. Six billion of them travel to malaria countries. Every day 4000 tracks pass through the country and most of them come from malaria areas such as Middle East country. In addition to this, shortage of trained personnel and breakdown of epidemiological research and uncontrolled irrigation is the main predisposing elements of the epidemics of malaria. It is certain that, if some basic and strict measures are not taken in Turkey, malaria epidemics will become a more serious problem than the existing situation.

Climate changes are the other predisposing factors of malaria risks. Global warming affects the country, especially in southern of Anatolia. This situation creates a serious risk regarding the vector species and also malaria parasites type. In the course of time, due to environmental temperature increases, the indigenous Anopheles' physiologic characteristics may change or new anopheles species may settle and Malaria falciparum may develop as indigenous cases in the country.

Chart 2: DISTRIBUTIONS OF THE MALARIA CASES IN TURKEY (1971-2001)



2. Regional Distribution

Malaria is not affecting the entire population of Turkey, because malaria cases are concentrated in some specific regions. Cases seen in other regions are imported cases, who have visited malaria areas. Regarding malaria risk, Turkey is divided into four main stratum. Stratum I is the endemic area and it includes Southeast Anatolian cities. Stratum II is the epidemic area and it includes White Sea, Aegean Sea and Thrace regions. Stratum III is the local epidemics area and it includes central Anatolian cities. And Stratum IV is the sporadic area and it includes Black Sea and Northeast Anatolian regions (see the Malaria Maps of Turkey). Out of 10812 total cases in 2001, 9987 (92.4%) were reported from only Stratum I B.

Only Stratum I and Stratum II have indigenous cases and more than %90 of the indigenous malaria cases were located in Stratum I (See table 2 and 3). Some provinces in the Stratum I have had indigenous cases since 1974. In 2001, 92% of cases reported from this stratum and local transmission is seen mainly in three provinces; Batman, Diyarbakır and Şanlı Urfa.

Stratum II has some indigenous cases time to time. All malaria cases of Stratum III and IV are imported cases from especially Stratum I.

MAP OF MALARIA STRATUM IN TURKEY

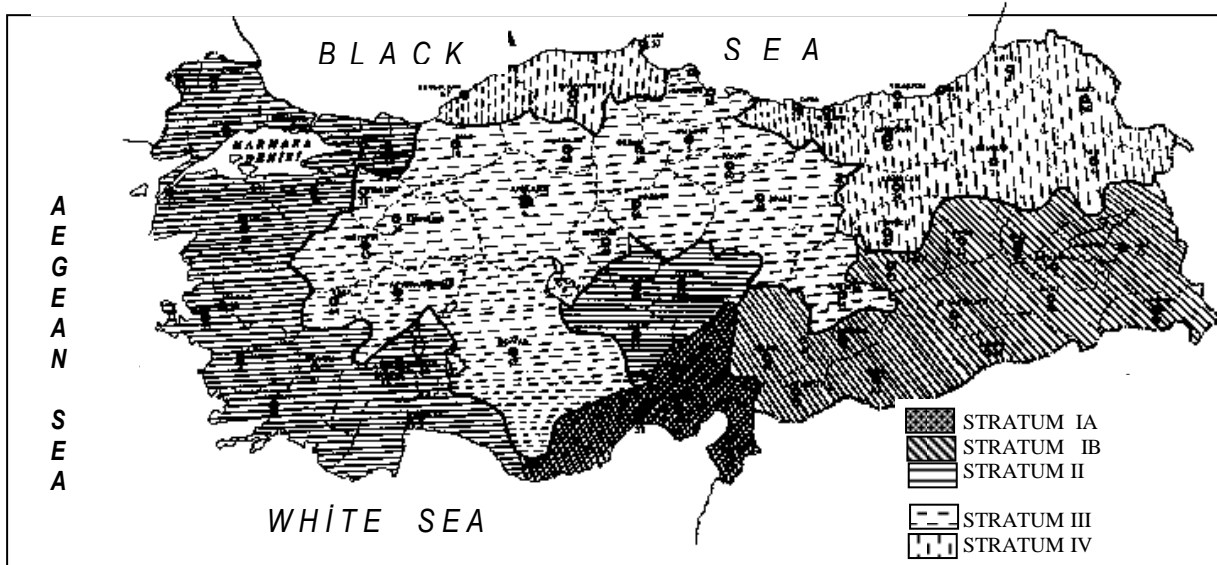


Table 2: DISTRIBUTION OF MALARIA CASES BY STRATUM (1995-2001)

	Stratum IV	Stratum III	Stratum II	Stratum I A	Stratum I B	TOTAL
1995	297	828	2593	6141	72237	82096
1996	181	631	2608	4172	53292	60884
1997	88	360	1264	2604	31140	35456
1998	99	315	1334	1344	33750	36842
1999	100	359	1514	650	18340	20963
2000	42	337	540	236	10277	11432
2001	38	171	285	331	9987	10812

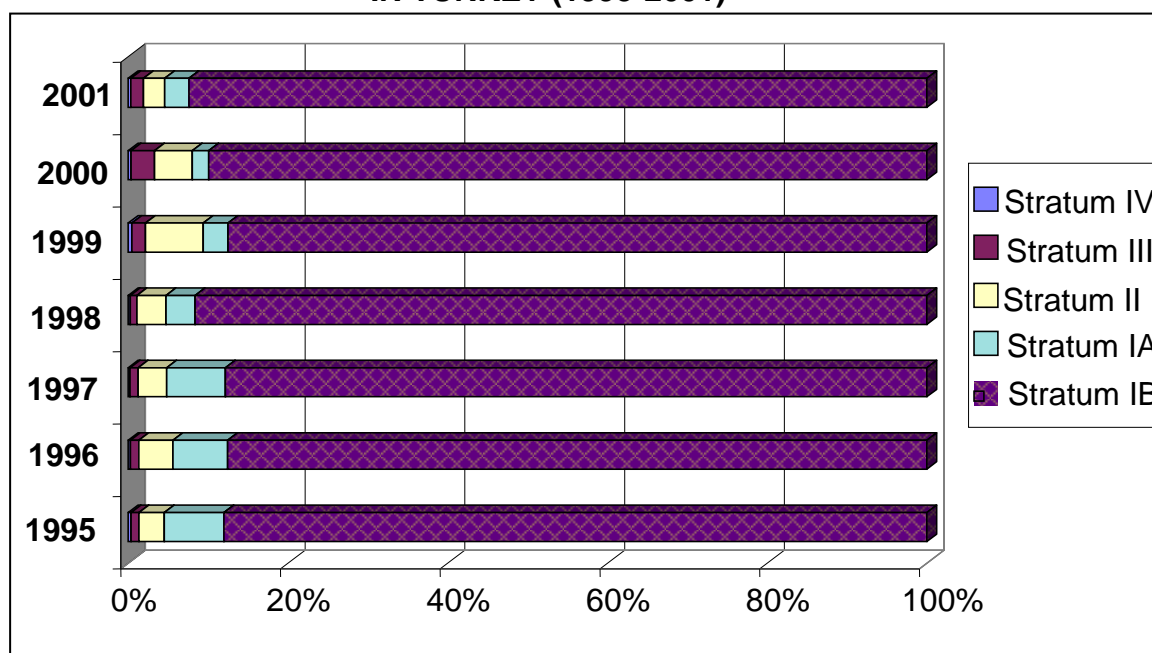
Source: Ministry of Health

Table 3: Malaria Cases and percentages In Stratum I B and Total number of Malaria Cases

YEAR	Stratum I B		TOTAL NUMBER OF MALARIA CASES
	Number Of Malaria cases	%	
1995	72237	88,0	82096
1996	53292	87,4	60884
1997	31140	87,8	35456
1998	33750	91,6	36842
1999	18340	87,5	20963
2000	10277	89,9	11432
2001	9987	92,4	10812

Source: Ministry of Health

**Chart 3: DISTRIBUTION OF MALARIA CASES BY STRATUM
IN TURKEY (1995-2001)**



3. Seasonal Distribution

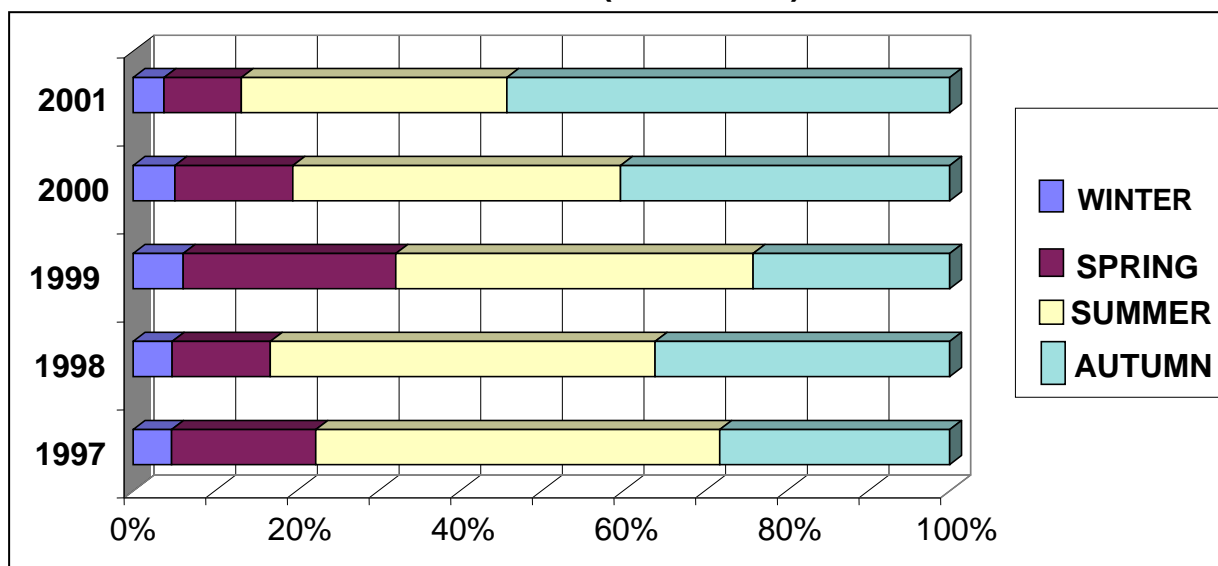
Anopheles Sachorovi and Macculipennis are the principle vectors of Malaria in Turkey. These species hibernate in winter, so the parasite does not transfer in this period. Due to this condition, malaria has a seasonal character in Turkey and parasite transmission occurs primarily from the end of March through November. As a result most cases are reported in summer and autumn (see table 3 and chart 4).

Table 4: DISTRIBUTION OF MALARIA CASES BY SEASON (1997-2001)

	1997	1998	1999	2000	2001
WINTER	1667	1760	1288	586	409
SPRING	6268	4434	5458	1650	1023
SUMMER	17536	17356	9172	4588	3516
AUTUMN	9985	13292	5045	4608	5864
TOTAL	35456	36842	20963	11432	10812

Source: Ministry of Health

Chart 4: SEASONAL DISTRIBUTION OF MALARIA CASES IN TURKEY (1997-2001)



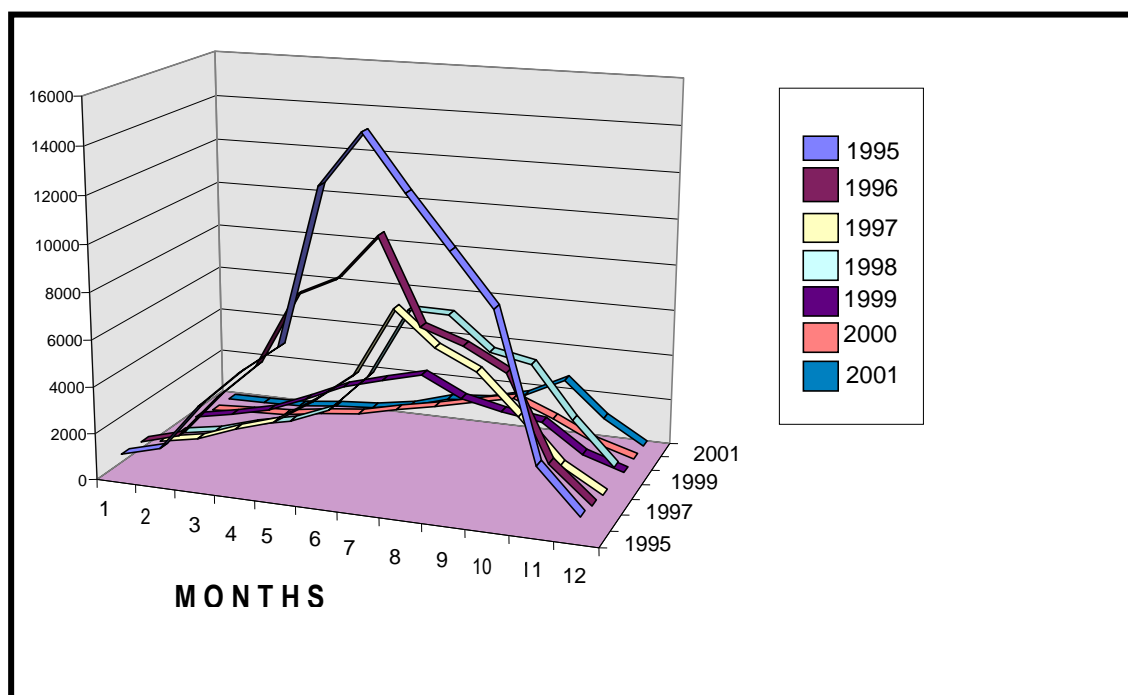
After winter and in March, environmental temperature is suitable for the vector to become active thus transmission starts and the number of cases begins to increase. Most of the new cases are found between July and November. After November, the number of cases decreases dramatically. Table 5 and chart 5 shows distribution of malaria cases by months and years in Turkey.

Table 5: DISTRIBUTION OF MALARIA CASES BY MONTH IN TURKEY (1995-2001)

	1995	1996	1997	1998	1999	2000	2001
JANUARY	1032	973	413	194	361	128	100
FEBRUARY	1496	1456	732	492	694	240	118
MARCH	3509	3328	1375	998	1097	319	166
APRIL	5081	4878	1897	1367	1800	572	364
MAY	6372	8021	2996	2069	2561	759	493
JUNE	13012	8846	4304	3754	3047	1164	779
JULY	15228	10793	7342	6817	3487	1515	1290
AUGUST	12993	7242	5890	6785	2638	1909	1447
SEPTEMBER	10896	6656	5069	5382	2253	2287	1880
OCTOBER	8796	5746	3383	5045	2000	1582	2754
NOVEMBER	2754	2230	1533	2865	792	739	1230
DECEMBER	927	715	522	1074	233	218	191
TOTAL	82096	60884	35456	36842	20963	11432	10812

Source: Ministry of Health

Chart 5: DISTRIBUTION OF THE MALARIA CASES BY MONTH IN TURKEY (1995-2001)



4. Type of Parasite Species and Source of Infections

All indigenous cases of Turkey agents are the Plasmodium Vivax. There are very rare cases due to other species, all of which are imported cases from abroad (see table 6). While there are no any direct deaths in Turkey due to malaria, we do not have reliable date about the indirect mortality of malaria. Especially, we do not know if there or not any aborts, still birth and maternal mortality due to the malaria. There may be such kind of deaths due to the malaria.

Table 6: DISTRIBUTION OF MALARIA CASES BY KIND OF SPECIES IN TURKEY (1994-2001)

YEARS	VIVAX	FALCIPARUM	MALARIA	MIXT	OVALE	TOTAL
1994	84317	24	2	1	1	84345
1995	82076	13	0	7	0	82096
1996	60863	20	0	1	0	60884
1997	35443	10	0	3	0	35456
1998	36824	14	2	2	0	36842
1999	20950	13	0	0	0	20963
2000	11424	7	1	0	0	11432
2001	10800	11	1	0	0	10812

Source: Ministry of Health

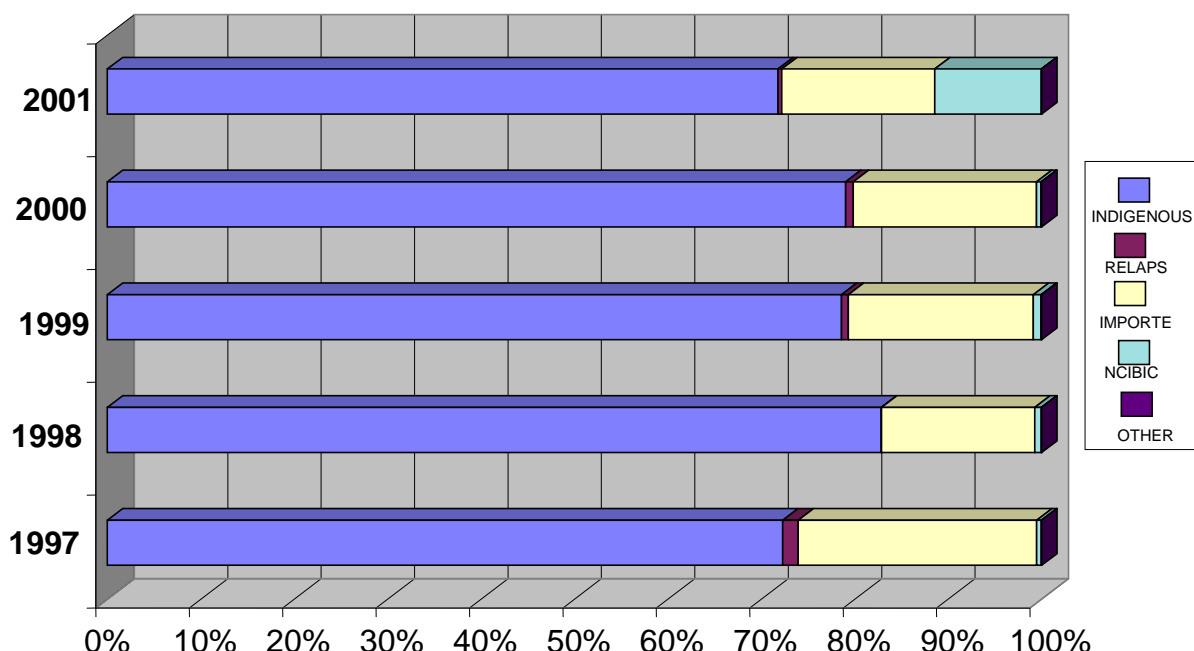
In the year 2001, 71.8% of the cases are indigenous and 16% of the cases are imported. Relapsed cases proportion is very rare and only 44. Some of the 10812 total cases are relapsed (see table 7 and chart 6).

Table 7: DISTRIBUTION OF MALARIA CASES BY SOURCE OF INFECTION IN TURKEY (1997-2001)

	1997	1998	1999	2000	2001	
					Number	%
INDIGENOUS	25637	30438	16472	9033	7762	71,79
RELAPSE	585	11	159	95	44	0,41
IMPORTED	9053	6023	4148	2241	1770	16,37
I by IC*	177	265	176	58	1234	11,41
OTHER	4	5	9	5	2	0,02
TOTAL	35466	36742	20963	11432	10812	100

*I by IC: Infected by imported cases
Source: Ministry of Health

Chart 6: Distribution of Malaria Cases by Source of Infection Types In Turkey (1997-2001)



5. Ages and Sex Distribution

In general, sex and age are not the important factors in Plasmodium vivax malaria. The situation in Turkey is no different. All sex and age groups have the same risks or sensitivity to the malaria. However, pregnant woman are at more risk than the others. Miscarriages, premature births and low birth weigh can be seen as complications.

P. Vivax malaria clinic is not so serious in infancy, but if malaria is found in the first year of infancy, it shows that local transmission is occurring. Thus infant malaria is important as an indicator of local transmissions.

As can be seen in Table 8, most of the cases are manifested at over the age of 15 probably due to social activities, especially working outdoors and mobility (see Table 8 and Chart 7).

Table 8: MALARIA CASES DISTRIBUTION BY AGE GROUPS IN TURKEY (1985-2001)

	0	1-4	5-9	10 - 14	15 +	TOTAL
1985	289	3253	6509	7838	29431	47311
1986	150	2693	5168	5975	23913	37899
1987	84	1792	3014	2998	12246	20134
1988	66	1516	2485	2431	9747	16245
1989	15	957	1655	1786	7709	12112
1990	30	668	1325	1261	5396	8680
1991	47	1065	1964	1854	7288	12218
1992	95	1682	3005	2793	11101	18676
1993	283	4211	6421	6691	29604	47210
1994	485	8019	14733	14877	46231	84345
1995	371	7321	12942	18079	43383	82096
1996	287	4847	8681	12286	43803	60884
1997	325	3382	4968	6217	20564	35456
1998	331	3957	5371	5870	21313	36842
1999	179	2206	2660	3105	12813	20963
2000	113	1320	1645	1599	6755	11432
2001	81	1162	1208	1316	7047	10812

Source: Ministry of Health

Chart 7: DISTRIBUTION OF MALARIA CASES BY AGE GROUPS IN TURKEY (1995-2001)

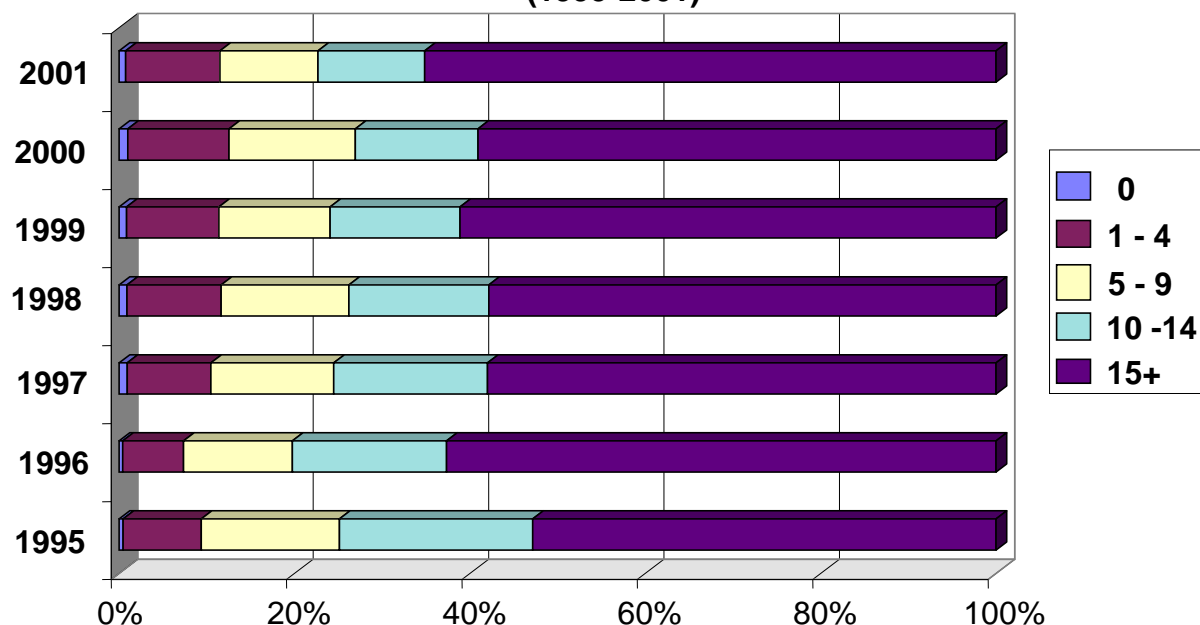
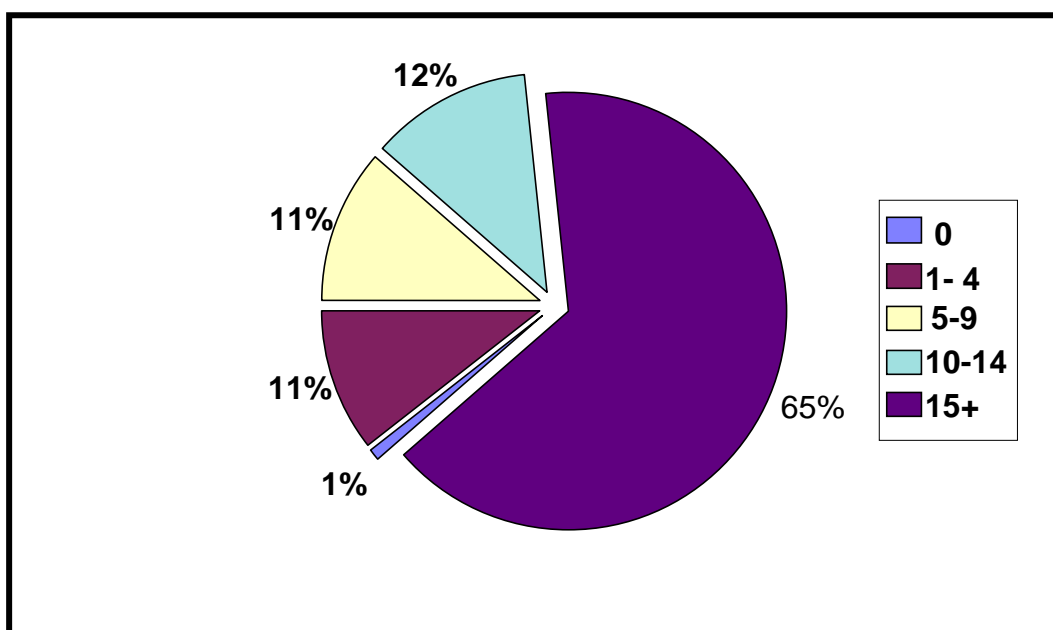


Chart 8: DISTRIBUTION OF MALARIA CASES BY AGE GROUP (2001)



6. Malaria Control Activities

The MOH requires reporting of all malaria (whether confirmed or suspected) cases. Reporting sources include all health units (primary, secondary and tertiary). All health units notify malaria cases at the end of the each month to the health directorate of provinces, and then provinces sent to the Malaria Department of MOH. This done manually, so some cases can be duplicated.

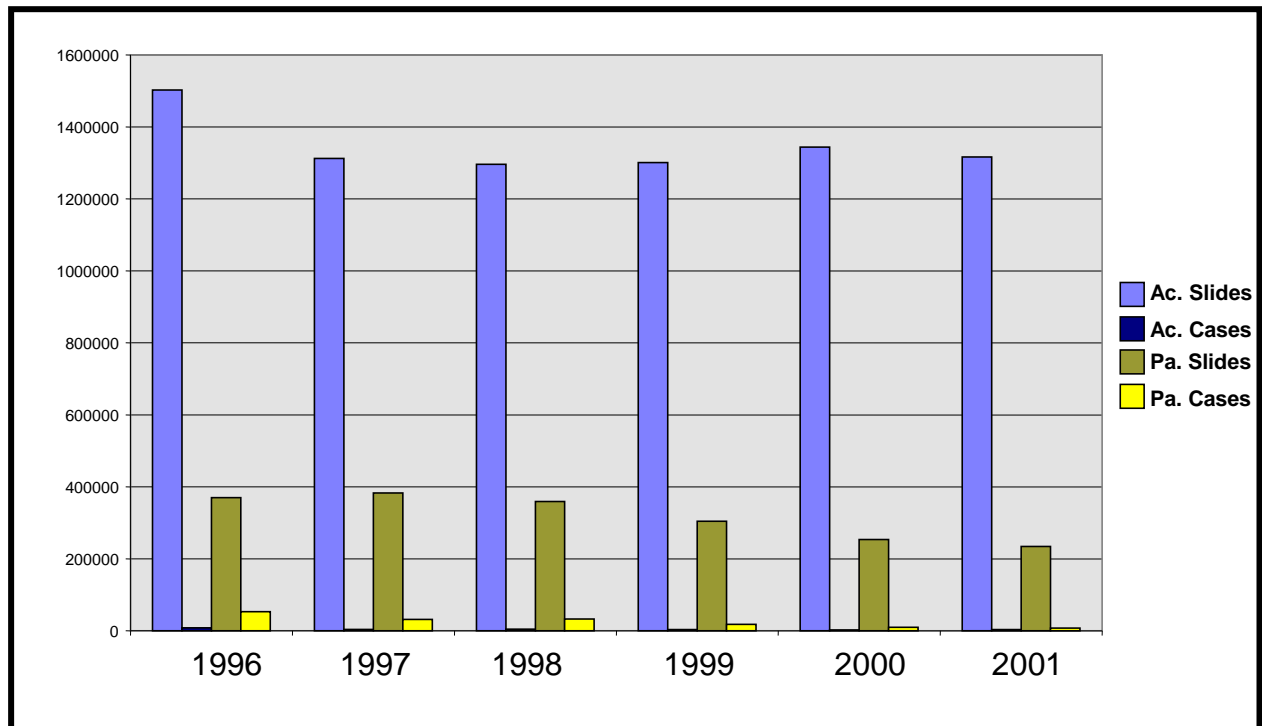
In 2001 of the total 1550521 blood slides taken in Turkey and 10812 (6.97%) were positive. Some (1316272) were taken by active method and 234250 by passive method. 2.36% of the active slides were positive and 32.91% of the passive slides were positive (see table 9, Chart 9).

Table 9: DISTRIBUTION OF THE MALARIA CASES BY TYPE OF SLIDES (1996-2001)

YEARS	Active Blood slide	Cases By Active Blood Slides		Passive Blood slides	Cases By Passive Blood Slides		Total Blood Slides	Total Cases	
		Number	%0		Number	%0		Number	%0
1996	1502113	8018	5,34	369743	52866	143,00	1871856	60884	32,53
1997	1311961	3915	2,98	382837	31541	82,40	1694798	35456	20,92
1998	1295981	4036	3,11	358981	32806	91,38	1654962	36842	22,26
1999	1300937	3198	2,46	304338	17765	58,37	1505275	20963	13,93
2000	1343728	1967	1,46	253562	9465	37,33	1597290	11432	7,16
2001	1316272	3102	2,36	234250	7710	32,91	1550521	10812	6,97

Source: Ministry of Health

Chart 9: DISTRIBUTIONS OF MALARIA CASES BY TYPE OF BLOOD SLIDES IN TURKEY (1996-2001)



7. Conclusions

Turkey has some indigenous focus of malaria. It seems that; the indigenous focus problem cannot be solved in the near future. If it can be solved, the malaria risks will go on in the future till Middle East territory has no malaria cases. For this reason, the national malaria control program of Turkey must be based on long-term strategies. Current applications are useful for the control of the cases but there is no long-term vision.

Curative and preventive malaria services are established by special malaria organization in most of the localities. This organization is relatively well functioning. However, lack of skilled personnel and basic equipment do not allow them early diagnosis and treatment malaria patients, especially in the peripheral level. Thus some of the cases are under-estimated. There are not enough active and selective active surveillance and mass screening applications. Passive surveillance applications are also not sufficient. There are no epidemiological evaluations of the cases. Present malaria surveillance system and case management must be strengthening.

Malaria control activities are based on early detection and treatment of the cases in Turkey. There are also some vector controls activities. However, especially during the last decades, the most emphasis has been given to reservoir control methods. Main constraints in this area are huge movements of population and unawareness of the importance of the problem of PHC personnel.

Turkey would like to integrate the malaria control activities into the general health system especially into primary health care services, but it could not be successful. Primary health care units do not give importance to malaria control, especially surveillance activities in their services. In the future, malaria control programs must be integrated in PHC services and all the health care personnel should be involved in this program.

Turkey has a big chance regarding the drug resistance. Indigenous parasites sensitive to all the classical malaria drugs, but, there are some uncontrolled and misunderstood uses of malaria drug and such kind applications may create drug resistance risks.