Trend of Measles Morbidity in Thailand

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Abstract

Rationale : Measle is still an important public health problem in Thailand despite the high coverage of measles vaccination since 1984, and the second dose of measles vaccination in primary school children in 1991.

Objective : To study the trend of measles morbidity in Thai children.

Material and Method : Review of the Annual Epidemiological Surveillance Report of the Epidemiology Section, Department of Communicable Disease Control, Ministry of Public Health (MOPH), and hospital records of measle cases at the Queen Sirikit National Institute of Child Health (QSNICH) (Bangkok Children's Hospital).

Paired *t*-test and analysis of variance (ANOVA) were used for data analysis in the present study.

Results : Before 1984, measles morbidity was very high, at the level of 52.3 to 93.67 per 100,000 population. After measles vaccine was included in the EPI (Expanded Program on Immunization), the morbidity fluctuated for some years, and the group of children infected with measles changed from under 5 years to the age group of 5-9 years old. So a second dose of measles vaccine was added to the EPI given to children in Prathom 1 (first year in primary school, 6 years old and over).

After 4 years of adding the second dose of measles in the EPI, measles cases was still present in a significant number in both the under 5 and 5-9 age groups[1]. From the statistics of measles cases at the QSNICH, with an average of 736 measles cases per year, the number of measles cases is now decreasing, but the incidence of measles is still high in both the under 5 and 5-9 age groups.

Conclusion : According to the EPI in Thailand, children were given measles vaccine at the age of 9 months which is when seroconversion was significantly lower than immunization after one year of age[2,5]. The trend of measles morbidity is decreasing, but is still high in children in the under 5

and 5-9 age groups. Vaccine failure may be one of the contributing factors of measles cases in children in these age groups[6-9]. A booster dose of measles vaccine at 15-18 months old is suggested in order to increase the seroprotection in children in the under 5 and 5-9 age groups.

Key word : Measles Morbidity, Measles Immunization

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J Med Assoc Thai 2003; 86 (Suppl 3): S707-S718

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Until 1984, there was a classic childhood examthem, measles occurred in every child, so there is a quotation that "everyone had to get measles". This childhood disease had a grave morbidity and mortality in Thai children until recently, after almost 20 years of childhood measles immunization, the morbidity and mortality of measles has markedly decreased[1]. A study was carried out on the trend of measles incidence by searching documents from the Annual Epidemiology Survillance Report, Department of Disease Control, Ministry of Public Health (MOPH) and the medical records of measles cases at the QSNICH.

Clinical manifestations of measles include high fever, sneezing, eyelid edema, tearing, copious coryza, photophobia, and harsh cough, Koplik's spot, maculopapular rash spread quickly over the face and trunk, coalescing to a bright red. As it involves the extremities, it fades from the face and is completely gone within 6 days; fine desquamation may occur. Fever usualy falls 2-3 days after onset of the rash[2-6].

Measles has prolonged symptoms for almost 7-10 days, and many patients develop complications, namely respiratory complications (15%), for example, bacterial superinfection of the lung, middle ear, sinus, and cervical node. Fever that persists after the third or fourth day of rash suggests such a complication. Bronchospasm, severe croup and progressive viral pneumonia or bronchiolitis (in infants) also occur. Immunosuppressive patients are at a much greater risk of fatal pneumonia.

Other complications include encephalitis (1 : 2000 cases), subacute sclerosing panencephalitis, hemorhagic or "black" measles (severe disease with multiple organ bleeding, fever, appendicitis, cerebral symptoms), thrombocytopenia, appendicitis, keratitis, myocarditis, optic neuritis, reactivation or progression of tuberculosis, and premature delivery or stillbirth[3,6].

In order to prevent measles, two doses of active vaccination are successful[2-8]. In Thailand, measles is one of the major health problems in Thai children and it causes significant morbidity and mortality. The Ministry of Public Health (MOPH) has incorporated measles immunization in the EPI for 9 month old infants since 1984[1].

However, seroconversion rates following measles or MMR vaccination are significantly lower in children vaccinated before their first birthday[1,3-8]. Therefore, children vaccinated before their first birthday should be vaccinated with measles or MMR vaccine at 12 to 15 months and a booster dose at school entry[3-6].

Four to five a years after measles immunization at 9 months old in Thailand, the morbidity of measles in Thai children is lower, but measles cases have changed from the under 5 years age group to the age group of 5-9 years old[1]. So, in 1991, the Ministry of Public Health added a booster dose of MMR for children in primary school (Prathom 1). This study aimed to study the trend of measles in Thailand from 1980 to 2001.

MATERIAL AND METHOD

The present study reviewed the Annual Epidemiological Surveillance report of the Epidemiology Section, Department of Communicable Disease Control, Ministry of Public Health, from 1980 to 2001 and also reviewed the measles cases from the medical records of the QSNICH from 1988 to 2002. The morbidity of measles in each age group was analyzed by using the paired *t*-test and analysis of variance (ANOVA).

RESULT

Before measles vaccine was included in the Expanded Program for Immunization (EPI), the morbidity rate of measles averaged 52.3 per 100,000 population with the highest rate in 1984 when the morbidity rate was 93.67/100,000 population. The Ministry of Public Health (MOPH) incorporated measles vaccine to the Expanded Program on Immunization (EPI) in 1984, to children at 9 months of age. In 1984, the vaccine coverage was 8 per cent, in 1986, vaccine coverage was 44.9 per cent, in 1988, the vaccine coverage was 55.5 per cent. From 1995, the vaccine coverage was over 90 per cent[1].

From Table 1. and Fig. 1, the incidence of measles cases in Thailand ranged from 35.6 to 93.67/100,000 population in 1984. Four to six years after measles vaccination, the incidence of measles is still high, though the age group has changed from under five to the age group of five to 9 years, (Table 2 and Fig. 2).

In 1991, the booster dose of measles vaccine was added to the EPI for children in prathom 1 (6 years and over). Four to six years after the booster dose, measles cases in the age group of 5-9 years has decreased along with the other age group (Table 2 and Fig. 2).

Measles morbidity was significantly lower after adding the booster dose of measles vaccine in the EPI ($p < 0.05$), as shown in Table 3. Measles morbidity rate in both the under 5 and 5-9 age groups is not different after the beginning of measles vaccination as shown in Table 4, 5.

Review of measles cases from the QSNICH from 1988 to 2000, the number of cases has decreased as shown in Table 6, 7.

From the statistics of the QSNICH since 1988, the incidence of measles averaged 736 cases per year. These data were reviewed after including measles vaccine in the EPI program in 1984, and after 1991 when the second dose of measles vaccine was added to children in primary one of school, the morbidity of measles was higher in children under 5 years of age, since 1988 to 2002. (Fig. 3)

Table 1. Morbidity rate of measles by year.

Year	Cases	Rate/100,000 population
1980	16,785	35.6
1981	-	40
1982	27,691	52
1983	34,713	65.1
1984	47,205	93.67
1985	32,156	62.2
1986	19,545	37.1
1987	42,172	78.7
1988	36,092	66.2
1989	12,474	27.46
1990	29,463	52.3
1991	26,709	47.14
1992	7,892	13.66
1993	17,851	30.6
1994	38,659	65.42
1995	11,112	18.69
1996	5,760	9.58
1997	15,122	24.87
1998	12,962	21.09
1999	3,312	5.38
2000	4,120	7.21

When the measles cases were adjusted by age per 100,000 population, the number of measles cases was highest in under one year old group and the under 5 years age group. (Table 8)

Measles morbidity rate per 100,000 population in the under 5 age group has decreased, but the morbidity rate in this group was quite high, and the number of cases in the age group over 10 years has increased (Table 9). The number of cases in the 5-9 year age group has decreased. (as shown in Fig. 4, 5)

When comparing the morbidity rate in each group, there is no significant difference in the measles morbidity rate at the QSNICH. (Table 10, 11)

When comparing the morbidity rate of measles by age group, the morbidity in the under 5, and 5-9 age groups are not statistically different.

DISCUSSION

Measles is a disease that occurs mainly in children which started from under one year of age before the vaccine era. After measles vaccination was started in any parts of the world, the incidence of measles decreased significantly all over the world including Thailand[1,2,4,5]. In the United States,

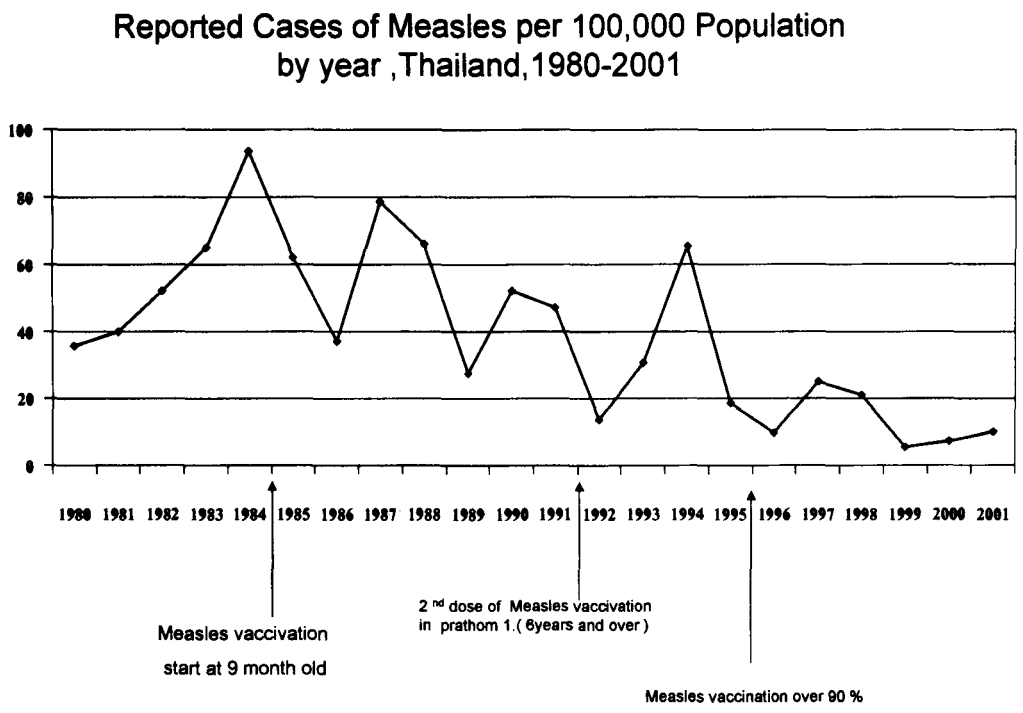

Fig. 1. Reported cases of measles per 100,000 population by year, Thailand, 1980-2001.

Table 2. Morbidity rate of measles by age group.

Year	Total case rate per 100,000	0-4 years per 100,000/population	5-9 years per 100,000/population
1989	22.46	95.98	80.79
1990	52.3	180.7	230.5
1991	47.14	138.24	195.66
1992	13.66	45.83	47.90
1993	30.6	-	-
1994	65.42	185.42	261.45
1995	18.69	66.94	61.72
1996	9.38	40.84	28.6
1997	24.87	95.97	85.01
1998	21.09	74.46	64.66
1999	5.38	28.02	13.21

measles vaccination was started in children 15 months of age in 1976, because there was a significantly lower rate of seroconversion in children younger than one year of age[3-6].

It was discovered that many measles cases occurred in children who had been vaccinated, which led to the recommendation of a second dose for children between the age of 5-9 years of age to ensure protection for those who had not developed immunity from the first doses[3-6]. At present, it is recommended that children be immunized between the age of 12 to 15 months. Two doses of measles vaccine given at 15 months and again in childhood (usually as MMR-measles-mumps-rubella vaccine) are now routinely recommended[2-6].

Properly administered measles vaccine has been associated with persistence of immunity to measles for many years. In one study, although measles NT

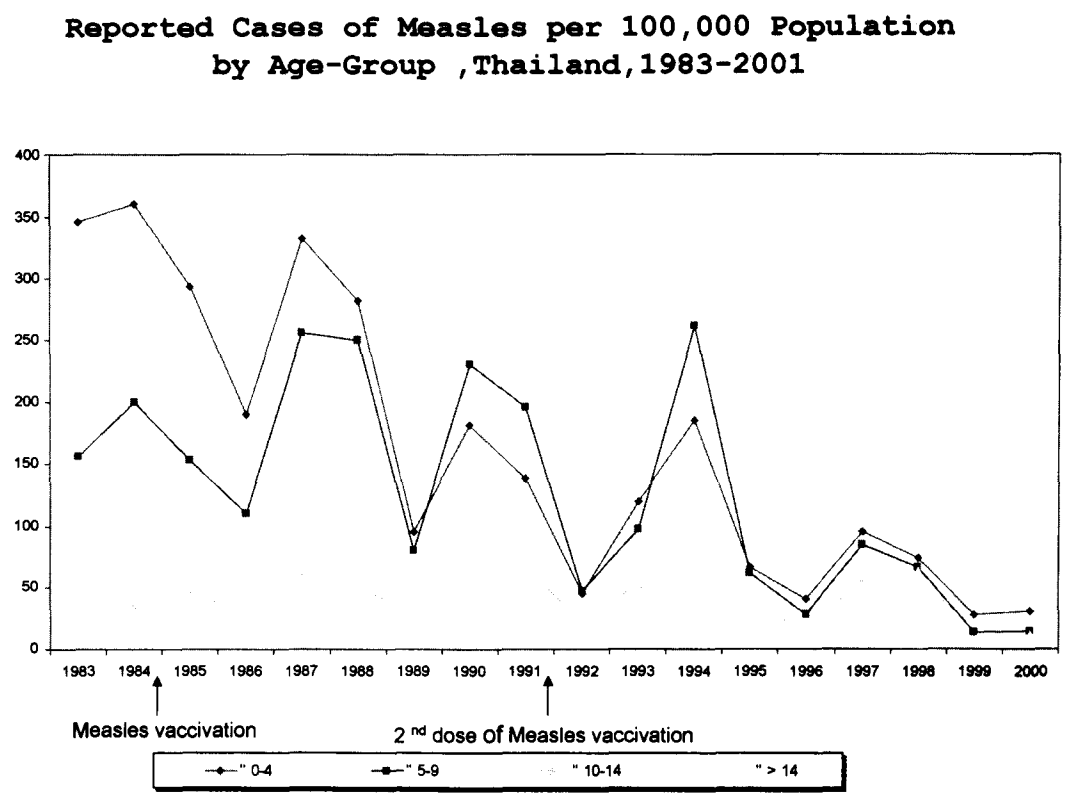

Fig. 2. Reported cases of measles per 100,000 population by age-group, Thailand, 1983-2001.

Table 3. Analysis of measles morbidity in Thailand before and after booster dose of measles vaccine in 1991.

	Paired differences					t	df	(2-tailed)
	Mean	Std. deviation	Std.error difference	95% confidence interval of the difference				
				Lower	Upper			
1984-1991	-53.5963	23.18930	8.19866	-72.9830	-34.2095	-6.537	7	0.009
1992-1999	-19.1613	19.76832	6.98916	-35.6880	-2.6345	-2.742	7	0.029

Table 4. Analysis of measles morbidity in the under 5 and 5-9 age groups after 1 dose of measles vaccine in EPI.

	Leven's test for equality of variances		*t*-test for equality of means						
	F	Significant	t	df	Sig. (2 tailed)	Mean difference	Std. difference	95% Confidence interval of the difference	
								Lower	Upper
Equal variances assumed	3.28	0.120	-0.447	6	0.671	-23.5250	52.65658	-152.4	105.321

Measles morbidity in under 5 and 5-9 age group are not significantly different. ($p < 0.05$)

Table 5. Analysis of measles morbidity in the under 5-and 5-9 age group after a booster dose of measles vaccine in EPI.

	Leven's test for equality of variances		*t*-test for equality of means						
	F	Significant	t	df	Sig. (2 tailed)	Mean difference	Std. difference	95% Confidence interval of the difference	
								Lower	Upper
Equal variances assumed	0.427	0.528	-0.089	10	0.931	-3.8333	43.28353	-100.3	92.608
Equal variances not assumed			-0.089	8.388	0.932	-3.8333	43.28353	-102.8	95.181

After a booster dose of measles vaccine in the EPI, measles morbidity in both groups were not statistically different ($p < 0.05$).

Table 6. Percentage of measles cases by age group, at the QSNICH from 1988-2002.

Year	Cases under 1 year	%	Cases 1-2 years	%	Cases 3-4 years	%
1988	272	17.99	522	34.52	364	24.07
1989	156	18.03	252	29.13	204	23.58
1990	295	16.80	477	27.18	360	20.51
1991	245	20.78	315	26.72	208	17.64
1992	40	24.10	49	29.52	39	23.49
1993	121	15.48	180	23.23	147	18.97
1994	464	22.91	513	25.33	322	15.90
1995	40	40	18	18	19	19
1996	62	43.36	20	14	23	16.08
1997	389	33.77	199	17.27	169	14.67
1998	147	29.22	101	20.07	74	14.71
1999	39	48.14	20	24.69	12	14.81
2000	51	38.64	21	15.91	20	15.15
2001	135	35.06	75	19.48	56	14.55
2002	87	31.86	72	26.37	41	15.02
Total	2,543	23.06	2,834	25.70	2,058	18.66

antibodies were no longer detectable in some subjects, antibodies were demonstrated by neutralization and revaccination was associated with a classic booster antibody response[3,4,6-10]. In the general population, 95 per cent of properly immumized children can be expected to respond serologically to measles vaccine[3,6].

Vaccination is not usually recommended for infants younger than 12 months of age because the induction of immunity may be suppressed by residual transpacentally acquired antibodies[3,6].

In Thailand, the incidence of natural measles before the age of 1 year is high, so the Ministry of Public Health recommended giving measles vaccine at 9 months of age[1,2], without any booster dose at all until 1991, a second dose of measles vaccine was added to the EPI, given to children at the first year of primary school (Prathom 1), or in children 6 years and over[1]. According to the American Academy of Pediatrics (AAP), if the measles vaccine was given to infants below one year of age, it should be followed by additional routine doses[3,6]. Measles antiboby titers are lower in women vaccinated in childhood than in women who have had natural measles, and the offspring of vaccinated women often lose transplacentally acquired measles antibodies before 1 year of age. Therefore, vaccination can be routinely given as early as 12 months of age, because most

Table 7. Percentage of measles cases by age group, from the QSNICH from 1988 to 2002.

Year	Cases 0-4 years	%	Cases 5-9 years	%	Cases over 9 years	%
1988	1,158	76.58	334	22.08	20	1.34
1989	612	70.75	233	26.93	12	2.32
1990	1,102	64.45	565	32.19	58	3.36
1991	768	64.89	366	31.04	45	4.07
1992	128	75.30	30	18.07	8	6.63
1993	448	57.81	272	35.10	55	7.08
1994	1,299	64.15	662	32.69	119	3.16
1995	77	77	20	20	3	3
1996	105	73.43	36	25.17	9	1.4
1997	757	65.71	316	26.56	79	7.72
1998	322	64.02	132	26.24	49	9.73
1999	71	87.65	6	7.40	4	4.94
2000	92	69.7	22	16.67	18	13.63
2001	266	69.10	2	18.70	47	10
2002	200	73.26	39	14.28	31	12.46
Total	7,435	67.43	3,035	27.52	557	5.05

Percentage of measles cases at the QSNICH was higher in children under 5 years old.

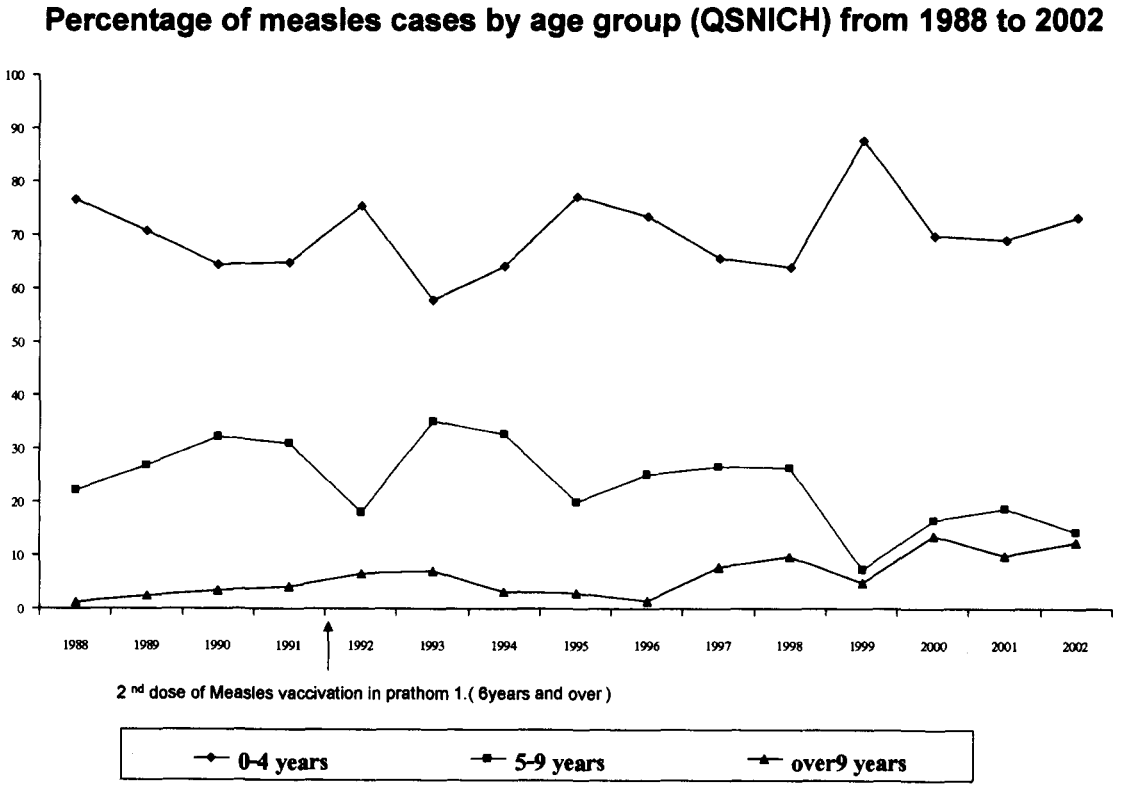

Fig. 3. Percentage of measles cases by age group (QSNICH) from 1988 to 2002.

Table 8. Morbidity of measles per 100,000 population by age group at the QSNICH from 1988 to 2002.

Year	Cases 0-1 years rate per 100,000 population	Cases 1-2 years rate per 100,000 population	Cases 3-4 years rate per 100,000 population
1988	488.02	749.19	792.72
1989	270.32	382.65	446.80
1990	503.73	711.76	855.5
1991	414.76	438.79	524.14
1992	69.47	69.38	98.28
1993	192.82	236.60	333.17
1994	705.51	668.05	686.13
1995	59.87	24.26	43.43
1996	84.45	23.09	48.43
1997	495.52	205.83	315.59
1998	206.55	104.24	128.69
1999	56.34	20.26	18.49
2000	70.10	23.39	29.52
2001	182.71	81.28	76.99
2002	121.22	83.86	65.27

Table 9. Morbidity of measles per 100,000 population by age group at the QSNICH from 1988 to 2002.

Year	Total 0-4 years rate per 100,000 population	5-9 years rate per 100,000 population	over 10 years rate per 100,000 population	Total number of cases rate per 100,000 population
1988	675.90	550.81	67.10	568.75
1989	361.60	379.95	38.72	327.26
1990	657.30	996.84	195.93	678.38
1991	451.80	689.59	170.32	76.23
1992	76.20	61.86	30.28	68.24
1993	24.50	525.35	202.37	293.75
1994	685.50	1,227.27	437.85	785.07
1995	41.70	41.88	12.58	38.97
1996	50.60	67.68	31.52	51.79
1997	330.90	480.61	248.43	350.31
1998	142.80	185.60	149.32	152.16
1999	30.50	8.16	12.23	23.87
2000	39.90	27.49	54.27	38.40
2001	111.30	2.15	125.17	85.10
2002	90.70	44.51	85.24	78.26

women of childbearing age today were vaccinated as children[3,9].

After 10 years of measles vaccination in Thailand, the measles cases still occurr in a significant number, and the highest morbidity rate was in the age group of 5-9 years in 1990. After the MOPH added a booster dose of measles vaccination for children in primary school (6 years and over) in 1991, measles morbidity has decreased in this age group. Overall, the morbidity of cases has decreased since then.

From the statistics of the QSNICH, the cases of measles are always higher in children under 5 years old, but when adjusted to morbidity rate per 100,000 population, the morbidity rate of measles at the QSNICH was higher both in the under 5 and 5-9 age groups.

Thai children are scheduled to get the first dose of measles vaccine at the age of 9 months, and the second dose at 6 to 7 years old. The vaccine coverage was high at above 90 per cent[1] but the

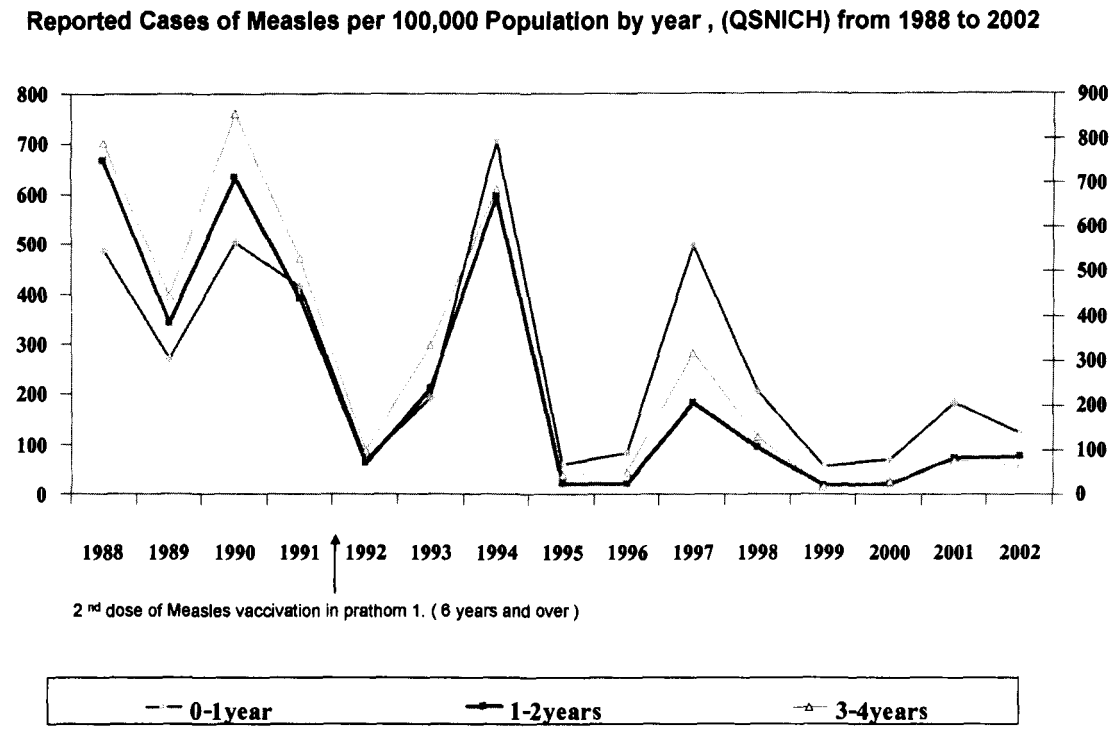

Fig. 4. Reported cases of measles per 100,000 population by year, (QSNICH) from 1988 to 2002.

number of measles cases is still high and cases in the hospital are still present[1]. Vaccine failure might be one of the contributing factors in measles cases in Thailand[6-9].

When looking at the age, the one year interval from the cases in the QSNICH, the prevalence of measles is still high in children under one year, 1-2 years, 3-4 years and also in the 5-9 age group.

The author suggest that the Division of Epidemiology, report the surveillance of children by dividing the age groups to only one year apart for example : 0-1 year, 1-2 years, 2-3 years, 3-4 years, 4-5 years, 5-6 years in order to know the number of measles cases more exactly, in order to set the proper time to give a booster dose of measles or MMR vaccine before the children contract measles.

Because the statistics show that children in the age group 0-4 years old are at high risk, the time of the second dose of MMR for children in prathom 1 may be too late to prevent measles. The Department of Communicable Disease Control may consider changing the recommendation of the second dose of measles vaccination before this age group; and the determination of the proper age group can be considered after analysis of the prevalence of measles in each seperate age group by yearly surveillance as suggested above.

From the statistics of measles cases in the QSNICH, from 1988 to 2002, the number of cases fluctuates each year. The highest prevalence of measles cases is in the age group under 1 year. The morbidity rate is not significantly different in each age group.

A number of reasons for apparent primary measles vaccine failure include improper storage of the vaccine at temperatures exceeding 4°C, failure to use the proper diluent for the lyophillized vaccine, exposure of the vaccine to light and heat, and vaccination in the presence of low levels of passive antibody[3,6]. The latter may occur if infants who are immunized at 12 months of age or younger. No deleterious effects have been associated with measle revaccination[11]. Although it is probably unusual, sustained transmission of measles has been reported in secon-

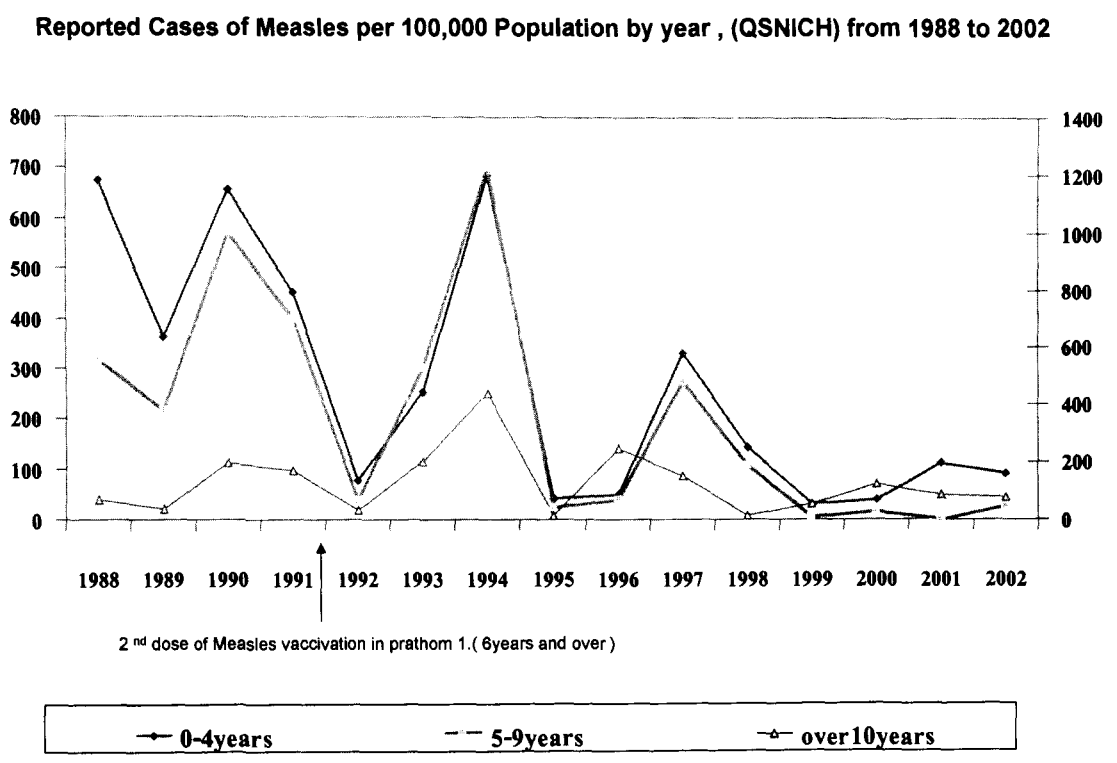

Fig. 5. Reported cases of measles per 100,000 population by year, (QSNICH) from 1988 to 2002.

Table 10. Comparing the morbidity rate in each age group (under 1 year, 1-2 years and 3-4 years) at the QSNICH from 1988 to 2002.

	Sum of squares	df	Mean square	F	Sig.
Between groups	12,360.476	2	6,180.238	0.088	0.916

Measles morbidity in these groups of children are not statistically different. ($p > 0.05$)

Table 11. Comparing the morbidity rate in the under 5, 5-9, and over 10 age groups at the QSNICH from 1988 to 2002.

	Sum of squares	df	Mean square	F	Sig.
Between groups	413,323.74	2	206,661.870	2.712	0.078

Measles morbidity in these groups of children are not statistically different. ($p > 0.05$)

dary schools even when 95 per cent of the students were immune and more than 99 per cent were immunized[5,8,9].

So it should be stressed to health personel who are responsible for measles immunization to take good care of vaccine storage and giving vaccinations, and also to survey for cases of measles in immunized children.

Measles elimination from the Americas appears to be an achievable goal due to an aggressive

measles vaccination program by the Pan American Health organization. In Thailand, measles morbidity is now continuously decreasing every year[7-9]. But a significant number of measles cases is still in the under 5 and 5-9 age group. Vaccine failure may be one of the contributing factors of some measles cases in these age groups. Measles survillance and missed opportunity survey for measles vaccination may help increase vaccine coverage in order to reach the goal of measles elimination.

(Received for publication on August 5, 2003)

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แนวโน้มของโรคหัดในประเทศไทย

*เชิดชู อริยศรีวัฒนา, พบ, สม**

หลักการและเหตุผล : โรคหัดยังคงเป็นปัญหาการเจ็บป่วยของเด็กในประเทศไทย ทั้ง ๆ ที่ได้เริ่มให้ วัคซีนโรคหัดมาตั้งแต่ปี พ.ศ. 2527 และให้วัคซีนเข็มที่ 2 ในเด็กประถม 1 ตั้งแต่ปี พ.ศ. 2534

วัตถุประสงค์ : เพื่อศึกษาอุบัติการณ์ของการเกิดโรคหัดของเด็กในประเทศไทย

วัสดุและวิธีการ : ทบทวนเอกสารจากรายงานการเกิดโรคประจำปี ของกองระบาดวิทยา กรมควบคุมโรคและทบทวนเอกสารจากเวชระเบียนผู้ป่วยโรคหัดของสถาบันสุขภาพเด็กแห่งชาติมหาราชินี (โรงพยาบาลเด็ก) กรมการแพทย์ และวิเคราะห์โดยใช้สถิติ paired *t*-test และ ANOVA

ผลการศึกษา : ก่อนปี พ.ศ. 2527 มีผู้ป่วยโรคหัดสูงมากจาก 52.3 คนต่อประชากร 100,000 คน หลังจากกระทรวงสาธารณสุขได้เพิ่มวัคซีนป้องกันหัดในแผนการสร้างเสริมภูมิคุ้มกันโรคทั่วประเทศ พบว่าอัตราการเกิดโรคหัดลดลง แต่อายุของเด็กที่ป่วยเปลี่ยนจากกลุ่มอายุต่ำกว่า 5 ปี ไปเป็นกลุ่มเด็กอายุ 5–9 ปี ดังนั้นกระทรวงสาธารณสุขได้เพิ่มวัคซีนป้องกันหัดเข็มที่ 2 ให้แก่เด็กในชั้นประถมศึกษาปีที่ 1 ในปี พ.ศ. 2534 จากปี พ.ศ. 2533 จนถึงปี พ.ศ. 2537 พบว่าเด็กกลุ่มอายุ 5–9 ปี มีอัตราป่วยเป็น โรคหัดสูงกว่ากลุ่มอื่น ในปี พ.ศ. 2538 ภายหลังจากเริ่มฉีดวัคซีนหัดเข็มที่ 2 มาได้ 4 ปี พบว่าอัตราการเกิดโรคหัดยังมีจำนวนมากทั้งในกลุ่มอายุต่ำกว่า 5 ปี และกลุ่มอายุ 5–9 ปี จากสถิติของสถาบันสุขภาพเด็กแห่งชาติมหาราชินี พบว่ามีจำนวนเด็กป่วยด้วยโรคหัดมารักษาที่สถาบันฯ เป็นจำนวนเฉลี่ย 736 คนต่อปี และพบว่าอัตราการเกิดโรคหัดมีมากที่สุดในกลุ่มเด็กอายุต่ำกว่า 5 ปี และในกลุ่มอายุ 5–9 ปี ตลอดมาแม้ในปัจจุบัน

สรุป : เนื่องจากในประเทศไทย เริ่มฉีดวัคซีนหัดในเด็กอายุต่ำกว่า 1 ปี ฉะนั้นเด็กที่ได้รับวัคซีน อาจตอบสนองต่อวัคซีนไม่ครบถ้วน ทำให้แนวโน้มของโรคหัดในประเทศไทยยังคงมีอยู่ในกลุ่มเด็ก อายุต่ำกว่า 5 ปี และในกลุ่มอายุ 5–9 ปี จึงขอเสนอให้ฉีดวัคซีนหัด เข็มที่ 2 เมื่ออายุ 15–18 เดือน เพื่อจะได้ทำให้จำนวนเด็กกลุ่มอายุต่ำกว่า 5 ปี และกลุ่มอายุ 5–9 ปี มีระดับภูมิต้านทานต่อหัดมากขึ้น

คำสำคัญ : อุบัติการณ์โรคหัด, การฉีดวัคซีนป้องกันหัด

เชิดชู อริยศรีวัฒนา
จดหมายเหตุทางแพทย์ ฯ 2546; 86 (ฉบับพิเศษ 3): S707–S718

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