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**CPITN AND PERIODONTAL PROFILES
IN MALAYSIA**

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BDS (Universiti Malaya 1978)

A thesis submitted in partial requirement for the
DIPLOMA IN PUBLIC HEALTH DENTISTRY



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Erratum

<i>Page</i>	<i>Line</i>	<i>Error</i>	<i>Correction</i>
8	1	periodontal	periodontal disease
11	12	Community Index of Treatment Needs	Community Periodontal Index Treatment Needs

SUMMARY

CPITN has been found to be a valuable index for assessing the prevalence of periodontal diseases and their resultant treatment needs. Its usefulness in manpower planning is handicapped by the lack of a specific methodology for manpower calculation associated with the index.

Data obtained using CPITN methodology through epidemiological surveys conducted in many countries throughout the world are collected and stored in the WHO Global Oral Data Bank in Geneva. These data have enabled overviews about the global profiles of periodontal to be made. It is recognised that though the prevalence of periodontal diseases is high in most countries, they do not pose as a major public health problem.

Concerns about the reliability and validity of the index stemmed from the fact that the index was originally meant to assess periodontal treatment needs only. When its usage was extended to include the assessment of disease prevalence, some of the assumptions used for the calculation of treatment needs were no longer applicable. To circumvent some of the problems raised by some investigators, the author suggests the use of a binary system of recording, which would make the index more reliable for assessing disease prevalence and their treatment needs.

The CPITN index was used in the Dental Epidemiological Survey of Adults in Malaysia 1990-1991. Initial analyses of the survey results revealed that 92.8 per cent

of the adult populations in Malaysia suffered from periodontal diseases. In spite of this high prevalence, the diseases did not seem to be a major public health problem as only 6 per cent suffered from irreversible stages of the diseases. The urban populations showed better periodontal conditions than their rural counter-parts.

Further analyses of the survey results revealed some interesting observations about the periodontal profiles in the country. The Other Bumis were found to have the worst periodontal conditions compared with the other ethnic groups. While the Indian/Pakistanis were found to have the best periodontal health in the early age groups up to the age of 29 years, this group was also found to have the highest prevalence of deep periodontal pockets in those aged 65 years and above, and interestingly they also showed the highest percentage with no periodontal conditions in the same age group.

Based on the results obtained from the survey it was possible to set more realistic periodontal health goals for the country for the year 2000. In order to achieve these goals, certain strategies have to be undertaken, including creating a new category of dental personnel to carry out TN 1 and TN 2.

In order to make the index a more powerful tool for manpower planning, the methodology for manpower calculation associated with the index has to be developed. Some of the interesting findings of the adult survey in Malaysia may need to be investigated further in order to determine their causes.

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DEDICATION

This thesis is dedicated to

my creator
and the source of my knowledge and wisdom
your grace has sustained me

my family:
my wife, Ngian, and my children
Ian Kree
Runin
Evan Rawing
Leo Ngerang

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1 INTRODUCTION

The Community Periodontal Index of Treatment Needs (CPITN) (WHO 1978; Ainamo *et al.* 1982) was designed for epidemiological and screening studies of periodontal diseases and conditions and to assess their resultant treatment needs.

The CPITN was designed by a joint working group from the Federation Dentaire Internationale (FDI) and the World Health Organization (WHO) established in 1979, specifically to assess the periodontal status and the periodontal treatment needs. It was meant to replace the then existing methods of assessment of periodontal status which were not satisfactory.

In order to do this the WHO convened a meeting of experts from fourteen member countries to conduct a comprehensive and critical review of current literature. The group forwarded their recommendations, which resulted in the development of the CPITN. The methodology for the new index was discussed and field testing was done in twelve countries. The final recommendations were prepared and published by a group of six experts in 1982 (Ainamo *et al.* 1982). An evaluation of various field trials was reported in the WHO document, *Community Periodontal Index of Treatment Needs: Field Testing And Statistical Evaluation* (WHO 1984b). The development of CPITN will be described in more detail in Chapter 2.

1.1 PERIODONTAL PROFILES

Since its inception, CPITN has been widely used in many countries throughout the world for the assessment of periodontal treatment needs. The WHO Global Oral Data Bank now has information on CPITN from more than one hundred countries (**Miyazaki *et al.* 1992**). Profiles of periodontal conditions in adolescents, adults and the older aged cohorts have been analyzed by various workers from this pool of data (**Pilot *et al.* 1986; Pilot *et al.* 1987; Miyazaki *et al.* 1991a; Miyazaki *et al.* 1991b; Pilot *et al.* 1992**).

From the overviews of the data examined by these workers it was revealed that the most frequently observed periodontal condition in adolescents in the age group 15-19 years was calculus with or without gingival bleeding (**Pilot *et al.* 1987; Miyazaki *et al.* 1991a**). Miyazaki and co-workers found that the prevalence of periodontal diseases for this age group in non-industrialised countries seemed to be more than in industrialised countries. They also found that the most frequently observed periodontal conditions in adults aged 34-44 years were calculus and shallow pocketing. The assumed difference between industrialised countries and non-industrialised countries with regard to periodontal health in adults were not reflected in the survey data examined.

From the available data it was shown that the progress of periodontal disease has been slow and seems to be compatible with retention of natural dentition until at least the age of 50. The older aged cohorts aged 65-74 years showed marked increase in tooth loss, specified by an increasing number of excluded sextants. Of the remaining sextants, approximately half had shallow and/or deep pockets (Pilot *et al.* 1992).

These workers expressed the opinion that the evaluation and discussion of the data on CPITN in the Global Oral Data Bank had to be done with caution because the surveys were done by different investigators under varying field conditions. Differences in application of the CPITN method and in the processing and interpretation of the results cannot be excluded completely. This is particularly true of studies conducted during the early stages of the development of the index.

The global profiles of periodontal diseases will be discussed in more detail in Chapter 3.

1.2 RELIABILITY AND WEAKNESSES OF CPITN

The major advantages of CPITN are its simplicity, reproducibility, speed and international uniformity. Compared with other epidemiological indices for periodontal health (e.g. Periodontal Index, WHO Periodontal Status Index), the CPITN is not only simple and practical but also more objective in its choice of clinical criteria and methodology. In particular, the data offer rapid appreciation of the periodontal condition of a population and treatment needs and the personnel required.

Several studies have validated the reliability of the CPITN in the epidemiological assessment of periodontal treatment needs. Essentially they conclude that the CPITN is a simple and appropriate procedure for recording periodontal conditions and relating them to the magnitude of care required for prevention and control of periodontal diseases (Ainamo *et al.* 1984; Sivaneswaran 1985; Cutress *et al.* 1986; Cutress *et al.* 1987;).

The limitations of CPITN include discrepancies associated with partial recording when compared with full mouth recording, exclusion of some important signs of periodontal breakdown, notably loss of periodontal attachment, and absence of any marker of disease activity or susceptibility. CPITN is, therefore, not a diagnostic tool and should not be used for planning of specific clinical treatment of individual patients (Cutress *et al.* 1987).

Other weaknesses of CPITN include its tendency to underestimate the number of individuals requiring complex therapy (**Ainamo and Ainamo 1985; Aucott and Ashley 1986; Gaengler *et al.* 1988; Miller *et al.* 1990**), and its tendency to overestimate the number of individuals requiring scaling at the expense of treatment for periodontal pockets (**Gaengler *et al.* 1988**).

One of the major shortcomings of CPITN is that the method for the calculation of the required manpower to treat the periodontal conditions, which have been assessed using the index, has never been developed, although **Ainamo *et al.* (1982)** had indicated that an appropriate methodology for the conversion of the treatment needs into manpower requirement would be developed.

Several workers (**Manji and Sheiham 1986; Zimmerman, Borstein, and Martinsson 1990; Butterworth and Sheiham 1991**) have tried to make use of the assessed treatment needs for the calculation of workforce requirement. But the calculations of the workforce were still based on treatment time estimates for each sextant or individual, and giving emphasis on a clinical approach as opposed to a community approach.

The reliability and weaknesses of CPITN will be discussed further in **Chapter 3**.

1.3 USE OF CPITN IN MALAYSIA

The Dental Epidemiological Survey of Adults in Malaysia carried out in 1990-1991 made use of the Community Periodontal Index of Treatment Needs to assess the periodontal conditions and their resultant treatment needs amongst the adult population of Malaysia (Ministry of Health, Malaysia 1993a).

The results of this survey revealed that the prevalence of periodontal diseases in the country is very high affecting 93 per cent of the adult population of the country. The assessment of the treatment needs revealed that only 7 per cent of the adult subjects did not require any treatment, 88 per cent required scaling and only 6 per cent required complex periodontal treatment. All of the subjects who have any form of periodontal problem required oral hygiene instructions (OHI).

Further analyses of the results of the Dental Epidemiological Survey of Adults in Malaysia 1990-1991 will be dealt with in **Chapter 4**.

1.4 OBJECTIVES OF THE THESIS

Due to conflicting reports about the reliability and weaknesses of the CPITN index, the author feels that there is a need to review the literature on these two aspects of the index. Another area of interest which will be reviewed in this thesis is the global profiles of periodontal conditions, and the profiles of the periodontal conditions in Malaysia assessed using the CPITN index. Thus the first objective of this thesis is to carry out a literature review on the following areas:

- i. reliability of the CPITN;
- ii. weaknesses of the CPITN;
- iii. profiles of periodontal conditions assessed using the CPITN.

This will be done in **Chapter 3**.

The second objective of the thesis is to conduct further analyses on the results of the Dental Epidemiological Survey of Adults in Malaysia 1990-1991 (**Ministry of Health, Malaysia 1993a**) regarding the periodontal status assessed using the CPITN. It was felt that there was a need to carry out further analyses on certain variables which were not highlighted in the initial analyses of the survey results. This will be done in detail in **Chapter 4**.

2 THE COMMUNITY PERIODONTAL INDEX OF TREATMENT NEEDS

2.1 INTRODUCTION

Having recognised that periodontal is one of the most widespread diseases of mankind, the Oral Health Unit of the World Health Organization took the initiative to organise a group of experts from fourteen member countries to conduct a comprehensive review of methods used to assess the prevalence and severity of periodontal diseases and their resultant treatment needs (WHO 1978).

The group recommended that a new index should be developed based on a combination of some the features of existing indices (Ainamo and Ainamo 1978). The proposed methodology was subjected to trials for epidemiological purposes. A joint working group from the Oral Health Unit of the World Health Organization, and from the Commission on Oral Health, Research and Epidemiology of the Federation Dentaire Internationale further deliberated on the new methodology. Field testing was conducted in twelve member countries and the data obtained were analyzed. Extensive discussions of the results of the analyses were carried out by members and associates of the Working Group. The final recommendation for scoring the Community Index of Treatment Needs was agreed at the meeting of the Joint FDI/WHO Working Group in 1981.

Since then numerous countries have adopted the index for epidemiological surveys of periodontal diseases and the data obtained from these surveys are sent to and stored in the WHO Global Oral Data Bank in Geneva for international comparison. Malaysia made use of this index in its Dental Epidemiological Survey of Adults in 1990-1991 **(Ministry of Health, Malaysia 1993a)**.

Based on this index, the WHO has set oral health goals for periodontal diseases in the context of its objectives of health for all by the year 2000 **(WHO TRS 713 1984)**. Each region of the WHO was supposed to come up with its own goals, and each country should set its reasonable goals to enable it to assess its own dental health services programmes.

2.2 HISTORY OF THE DEVELOPMENT OF CPITN

The World Health Organization was concerned about the high prevalence of periodontal diseases throughout the world. It took the initiative to organise a meeting of experts from fourteen member countries to examine and advise it on the epidemiology, aetiology of periodontal diseases. The meeting took place in Moscow from 23 November to 2 December 1977 (Ainamo *et al.* 1982).

The group conducted a review of the current methods used to assess the prevalence and severity of periodontal diseases and the resultant treatment needs. The group came up with a proposal based on a combination of the clinical examination developed by Ainamo and Ainamo (1978), the screening system by O' Leary (1967) and Johansen *et al.* (1973) (WHO 1978). The methodology proposed would record treatable conditions rather than their causes, having in mind the evaluation of treatment needs. Thus conditions like plaque, gingival recession and tooth mobility were excluded from the recordings.

2.2.1 Trial Survey Methodology

Members and associates of the joint working committee of FDI and WHO tried the survey methodology in 12 countries following the annual congress of FDI in Madrid in 1978. The data collected were first analysed at the WHO Headquarters in Geneva, and subsequently at the University of Nancy in France.

The results of the analyses were discussed by members of the Working Group in Paris (1979), in Hamburg (1980) and in London (1981).

2.2.2 Final Recommendations

The final recommendation for scoring the Community Index of Treatment Needs was agreed at the meeting of the Joint FDI/WHO Working Group in Rio de Janeiro in September 1981 (*Ainamo et al.* 1982). At the meeting it was proposed that the method of scoring proposed in the WHO Technical Report Series No. 621 (**WHO 1978**) be replaced.

The original proposal contained the following features which were later changed:

- i. In agreeing to adopt a partial recording approach of the dentition, the Group suggested the use of only six representative teeth, one per segment. The use of selected teeth for partial mouth recording was proposed by Ramfjord (1959) for recording of periodontal disease. The teeth to be scored are:

16	21	24
44	41	36

The sites for probing are the mesial and buccal aspects of maxillary teeth, and mesial and lingual aspects of mandibular teeth.

ii. Originally, the recordings were made in the following order, for the presence or absence of:

1. Supragingival calculus.
2. Subgingival calculus.
3. Pocket depths of 4 or 5 mm.
4. Pocket depths of 6 mm or more.
5. Gingival bleeding after probing.
6. Recession (eventually discarded by the group).

The assessment of the periodontal conditions were recorded using the following codes:

a. Calculus

0 = no supragingival or subgingival calculus present

1 = supragingival or subgingival calculus present

b. Assessment of periodontal pockets

0 = clinical gingival sulcus of 3.5 mm or less

1 = pockets greater than 3.5 but equal to or less than 5.5 mm

2 = pockets greater than 5.5 mm

c. Assessment of gingivitis

After probing for calculus and pockets, the teeth are reexamined for any gingival bleeding.

0 = no bleeding detected

1 = bleeding detected

d. Assessment of gingival recession

0 = root exposure of 3.5 mm or less

1 = root exposure of more than 3.5 mm but less than or equal to 5.5 mm

2 = root exposure of more than 5.5 mm.

This order of scoring and the codes were later changed when the final recording criteria for CPITN were adopted.

While retaining most of the recommendations, the Group replaced the recommendations mentioned above and adopted the approach based on O'Leary's method (O'Leary 1967), in which the dentition is divided into six parts called sextants. The sextants contain the following teeth:

17 - 14	13 - 23	24 - 27
47 - 44	43 - 33	34 - 37

The third molars are not used for scoring, unless they function in place of the second molars when the latter are absent.

The scoring for the periodontal conditions are based on the examination of the following index teeth:

17, 16	11	26, 27
47, 46	31	36, 37

Although ten index teeth are examined, only six recordings are taken, one per sextant.

However, in subjects below the age of 20 years, only the first molars are examined in the posterior sextants in order to avoid the recording of false pockets around the newly erupted second molars (**Ainamo *et al.* 1982**). The second molars are excluded as index teeth because of high frequency of false pockets associated with tooth eruption (**Sivaneswaran 1985; Cutress *et al.* 1987**). Only six index teeth, represented in the following chart, are examined.

16	11	26
46	31	36

When examining children less than 15 years of age, pockets are not recorded although probing for bleeding and subgingival calculus are carried out as routine (**Cutress *et al.* 1987**).

The details of the scoring system which was recommended by the Joint Working Group of FDI/WHO, for CPITN will be described later in this chapter.

2.2.3 The WHO Periodontal Probe

Another historical aspect related to the development of the Community Index of Treatment Needs is the concurrent development of a specially designed probe called the WHO Periodontal Examination Probe (**Ainamo *et al.* 1982**), which is an indispensable part of periodontal assessment using CPITN. Since the probe was first described by WHO in its Technical Report Series 621, it has been variously called the *621 periodontal probe* or simply as the *621 probe*. The use of this probe was suggested in the Moscow meeting (**WHO 1978**). The features of this probe were described by Emslie (1980).

The 621 probe was designed by Professor George S. Beagrie of Vancouver and Professor Jukka Ainamo of Helsinki (**Emslie 1980**). The probe has the following specifications:

1. It should be metal with a knurled handle of diameter 3.5 mm and a maximum weight of 4.5 g.
2. It should have at the working tip a sphere of 0.5 mm diameter; the probe has a minimum diameter of 0.25 mm at the neck where the sphere is attached, with an approximate taper from the handle.
3. It should have a black band between 3.5 and 5.5 mm from the end of the probe.

The lightness and the spherical tip are characteristics of particular importance for detection of subgingival calculus, and to ensure minimal trauma when probing the gingival sulcus. The contra-angle reduces the twisting moment when probing for calculus, and the knurling of the shaft permits a very gentle grip to be employed. The design and essential features of the periodontal probe are shown in **Figure 1** and **Figure 2**.

Figure 1

Essential features of the periodontal probe design.

Source: Cutress et al. (1987)

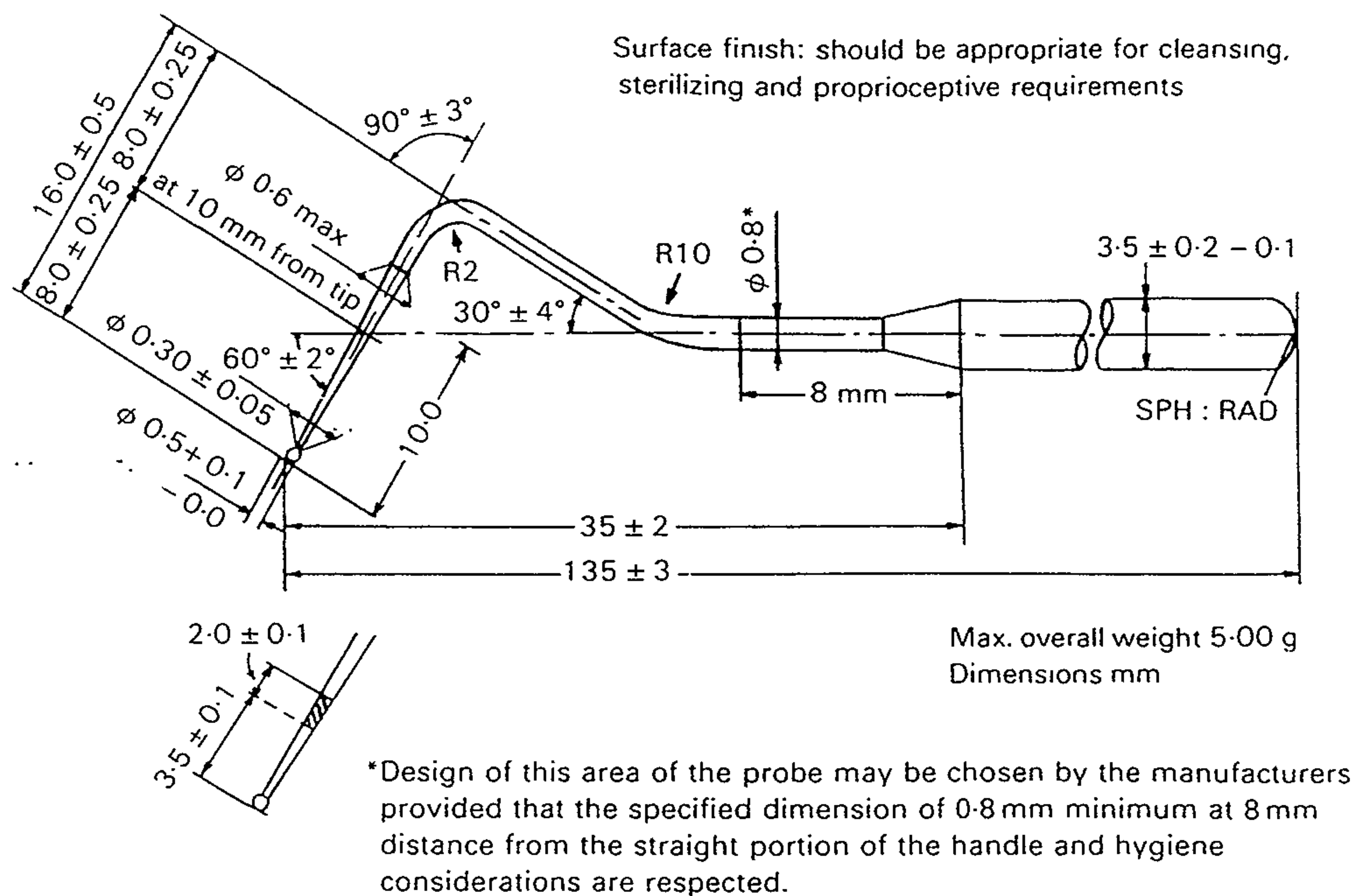
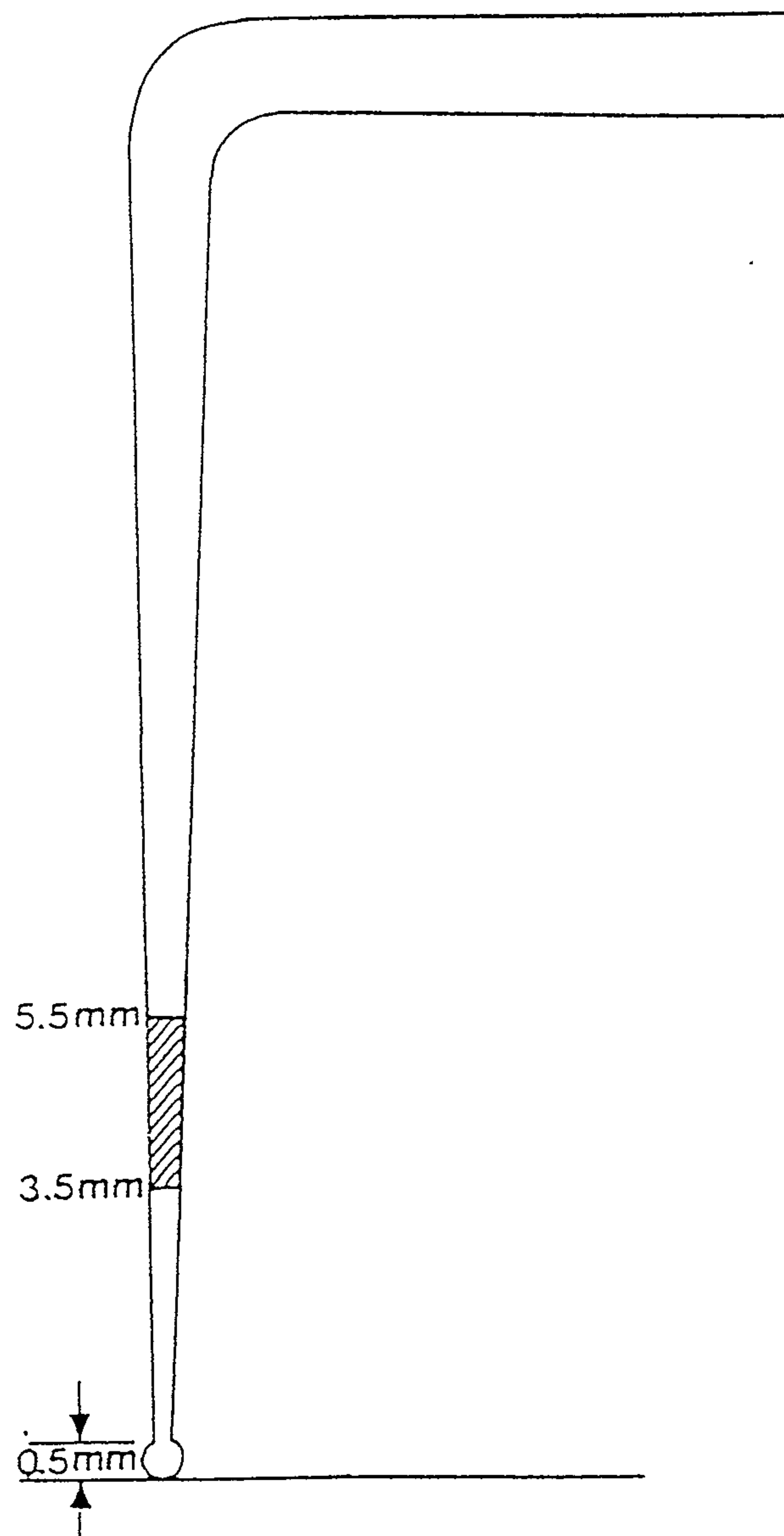


Figure 2

The WHO periodontal probe used for detecting subgingival calculus, evaluate pockets depth and gingival bleeding

Source: Ainamo *et al.* (1982)



The probe was first designed and used for the field testing of the CPITN methodology in twelve countries, and its use was accepted by the Joint FDI/WHO Working Group in October 1979.

2.3 METHODOLOGY OF CPITN

In dental epidemiological surveys using CPITN, the worst periodontal condition of the specified index tooth/teeth in each sextant is recorded for that sextant. The assumptions here are: when a tooth has a periodontal pocket, it is presumed that it also has calculus and gingivitis, and when a tooth has calculus, it is presumed to have gingivitis also. This is called the hierarchical scoring system.

2.3.1 Probing Procedure

A tooth is probed to determine pocket depth and to detect subgingival calculus and bleeding response. The probing force is divided into a working component to determine pocket depth, and a sensing component to detect subgingival calculus. Detection of the subgingival calculus is only necessary when there is no visible supragingival calculus. The working force should be no more than 25 g; a practical test for establishing this force is to gently insert the probe tip under the finger nail (**Figure 3**) without causing pain or discomfort. Pain or discomfort is indicative of too much force.

When inserting the probe into the gingival pocket the ballpoint should follow the anatomical configuration of the surface of the tooth root. For sensing the subgingival calculus, the lightest possible force which will allow movement of the probe ballpoint along the root surface is used (**Ainamo *et al.* 1982**).

Ainamo *et al.* (1982) did not specify the number of separate probing sites per tooth. However, in order to ensure uniformity of recordings within each examiner and between examiners in epidemiological surveys, it would be better that the probing sites be specified in the survey protocol.

2.3.2 Recording Procedure

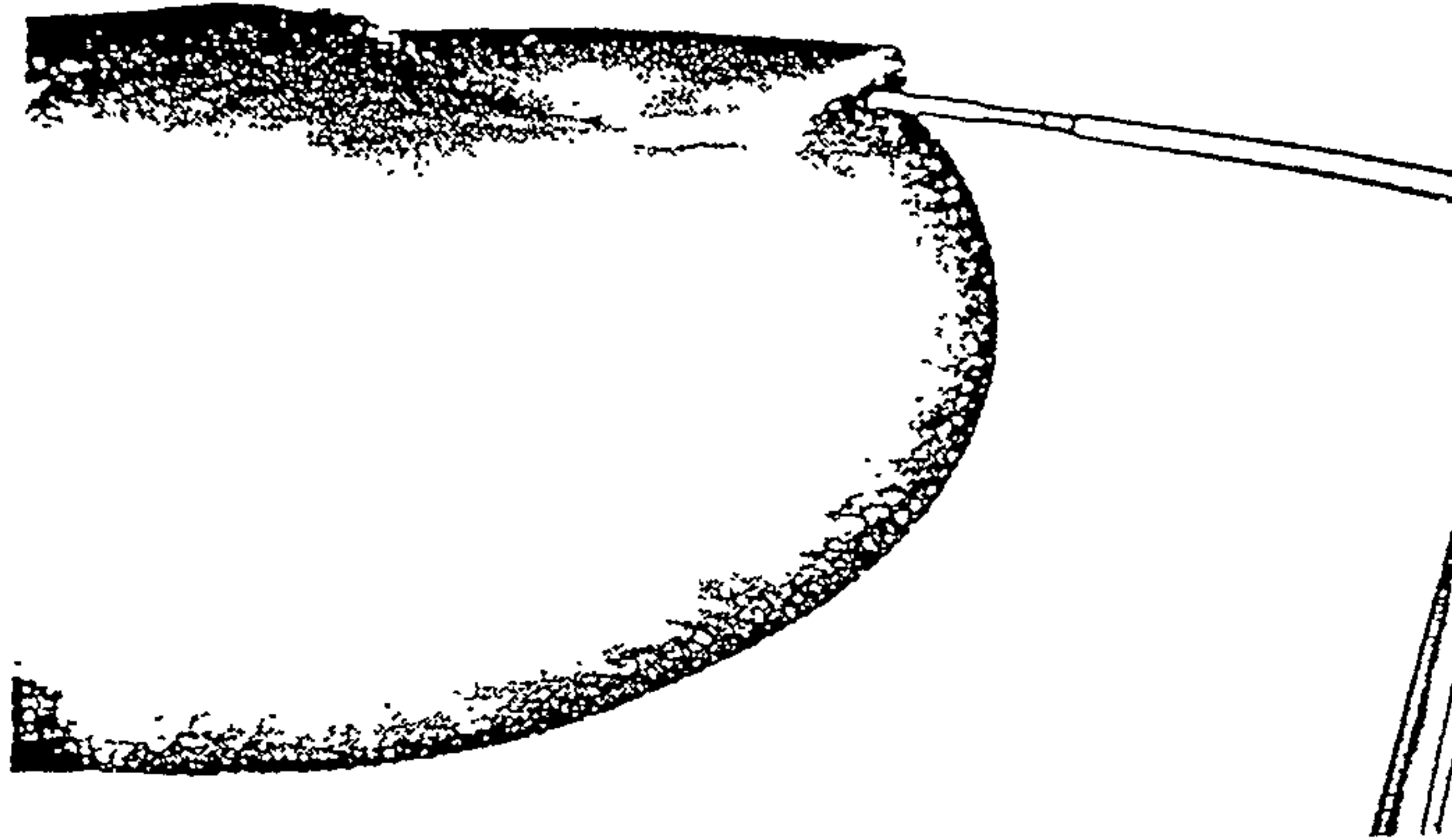
In assessing treatment needs, the presence or absence of periodontal conditions are recorded using specific codes. The sequence of the recordings is done in the following way:

Pathological pocket 6 mm or deeper	code 4
Pathological pocket 4 or 5 mm deep	code 3
Supra- or subgingival calculus	code 2
Gingival bleeding after probing	code 1
No sign of disease	code 0
Only one or no tooth in a sextant	code X

The index tooth or teeth in each sextant is/are probed and examined to determine the presence or absence of any periodontal condition. Whenever the black band of the periodontal probe is not visible any more after insertion into the periodontal pocket of an index tooth in a sextant, a 6 mm or deeper pocket is found and a code of 4 is given to that sextant. Recording of code 4 makes further examination of that sextant unnecessary. When the pocket depth is within the black band of the probe, a pocket of 4-5 mm deep is found and code 3 is given to that sextant. Again there is no further examination required. If all the black band is still visible upon insertion into the gingival crevice no pathological pocket is detected.

Figure 3

Practical test for establishing probing force
Source: Ainamo *et al.* (1982)



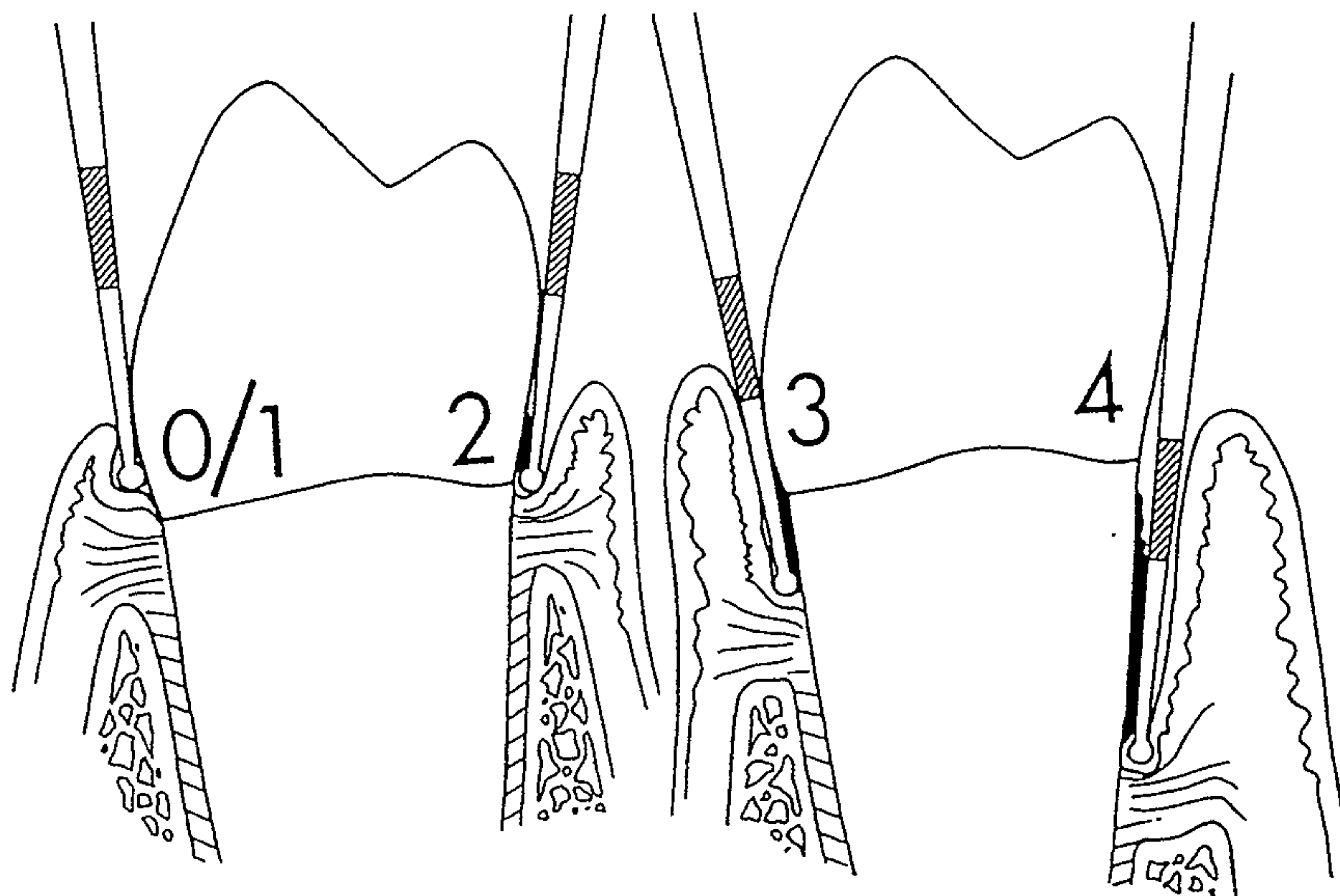
Subsequent examinations should look for the presence or absence of calculus; supragingival calculus is detected by visual examination, and subgingival calculus is detected by using the ballpoint of the probe. The presence of calculus is given a code of 2. If neither deep or moderate pocketing nor calculus is observed, but bleeding occurs after probing, a code of 1 is given to that sextant. The gingivae of the index tooth should be inspected for bleeding before the examinee is allowed to swallow or close his mouth. At times bleeding is delayed for 10-30 seconds after probing. If there is no pathology code 0 is given to the sextant (Ainamo *et al.* 1982).

When there is only one or no more teeth present in the sextant that sextant is excluded from examination and a code of X is given to the sextant (Cutress *et al.* 1987). The codes are represented diagrammatically in Figure 4.

Figure 4

Diagrammatic representation of codes for recording periodontal conditions using CPITN

Source: Ainamo *et al.* (1982)



2.3.3 Calculation of Disease Prevalence

The survey charts of the subjects examined are sorted out according to the highest score recorded (Cutress *et al.* 1987). The charts with all sextants coded X are excluded from further analysis of CPITN. Only dentate subjects are considered for further analyses.

In order to obtain the prevalence of the persons affected, the total number of charts with each highest score ranging from zero (0) to 4 are sorted and counted, and each category is then divided by the total number of dentate subjects examined. The prevalence is expressed as the percentage of persons having healthy mouth (H) (highest score of zero), the percentage of persons with gingivitis (B) as the worst periodontal condition (highest score of 1), the percentage of persons with calculus (C) as the worst periodontal condition (highest score of 2), the percentage of persons with moderate pockets (P1) as the worst periodontal condition (highest score of 3), and the percentage of persons with deep periodontal pockets, P2 (highest score of 4). The results are tabulated in the following manner:

Table a. Prevalence of person affected

Age	No. Examined	No. of dentate persons	H	% person coded			
				B	C	P1	P2

Note: Total H+B+C+P1+P2 = 100%

Source: Cutress *et al.* 1987

2.3.4 Calculation of Mean Number of Sextants

The severity of the periodontal conditions can be determined by the mean number of affected sextants. There are two ways to do this. The first, the WHO preferred method, is to consider the cumulative scores of the diseases. The mean numbers of affected sextants are calculated in the following way (Cutress *et al.* 1987):

Step 1: From the charts of dentate persons, count the number of sextants which have:

healthy sextants (H)	code 0
bleeding (B)	codes 1 or higher
calculus or overhangs (C)	codes 2 or higher
pockets 4 or 5 mm (P1)	codes 3 or higher
pockets 6 mm or deeper (P2)	code 4
edentate or excluded sextant	code X

Step 2: For each condition, obtain the mean number of sextants (MNS) per person by dividing the total number of sextants with that score (or higher) by the number of dentate subjects.

The mean number of sextants affected per person is shown in a table as follows:

Table b: Mean number of sextants affected per person

Age group	No. of dentate persons	Mean no. of sextants coded					
		H	B	C	P1	P2	X

Note: Scores H+B+C+P1+P2+X do not = 6 (except when all sextants score 0, 1 or X).
Source: Cutress *et al.* 1987

An alternative way of presenting the mean number of sextants affected is by considering the sextants separately-not cumulatively as above. The steps in the calculation of the mean number of sextants are as follows:

Count the number of sextants which have:

healthy tissue (H)	code 0
bleeding (B)	code 1
calculus or p.r.f.(C)	code 2
pockets 4 or 5 mm (P1)	code 3
pockets 6 mm or deeper (P2)	code 4
edentate or excluded sextants	code X

The total number sextants scoring 0, 1, 2, 3, 4 or X is divided by the number of dentate persons to obtain the mean number of sextants affected. The table for the presentation of the mean number of sextants is similar to the Table b above except that the total for $MNS\ H+B+C+P1+P2+X=6$

2.3.5 Calculation of Treatment Needs

Based on the CPITN methodology each of the subjects is categorised into one of the three treatment options, namely oral hygiene instruction (OHI) as TN 1, scaling and OHI as TN 2 or complex treatment plus scaling and OHI as TN 3. A person who is healthy periodontally and does not require any periodontal treatment is accorded TN 0 (Cutress *et al.* 1987).

The percentage of persons requiring no treatment (TN 0) and those requiring periodontal treatment TN 1, TN 2, TN 3 and the mean number of sextants requiring TN 2 and TN 3 are deduced directly from Tables a and b above in the following way:

$\% \text{ TN } 0 = \% \text{ code H}$
 $\% \text{ TN } 1 = \% \text{ codes B+C+P1+P2}$
 $\% \text{ TN } 2 = \% \text{ codes C+P1+P2}$
 $\% \text{ TN } 3 = \% \text{ code P2}$

The treatment needs, expressed as the percentage of persons categorised by one of the three treatment options, and the percentage of those who do not require any treatment, are tabulated in the following way:

Table c: Treatment needs

Age	No. of dentate persons	%TN 0	%TN 1	%TN 2(MNS)	%TN 3(MNS)

Source: Cutress *et al.* (1987)

2.4 OBJECTIVES AND USES OF CPITN

The Community Periodontal Index of Treatment Needs (CPITN) was originally intended as a fast and simple screening procedure for epidemiological survey of periodontal disease in a population group (**Cutress *et al.* 1987**) rather than periodontal status (**Ainamo *et al.* 1982**). For this purpose, it was decided to record only the worst periodontal condition around each index tooth. Such a recording can be regarded as a hierarchial scoring method (**Grytten *et al.* 1989**).

Over the years since its inception, the Community Periodontal Index of Treatment Needs (CPITN) has been widely adopted as a procedure for describing the prevalence of periodontal diseases. It has also been widely adapted and adopted for other purposes: in a promotional role in developing periodontal health awareness programmes, for screening and for monitoring changes in periodontal needs of individuals in clinical practice (**Cutress *et al.* 1987**).

Compared with previously available epidemiological indices for periodontal health, CPITN is a procedure which uses clinical parameters and criteria relevant to planning for the prevention and control of periodontal diseases. The CPITN is not intended as a comprehensive assessment of total past and present periodontal disease experience (**Cutress *et al.* 1987**). The method has been incorporated in the WHO Manual, *Oral Health Surveys: Basic*

Methods, Third Edition (**WHO 1987**).

The CPITN records the common treatable conditions, namely periodontal pockets, gingival inflammation (identified by bleeding on probing), and dental calculus and other plaque retentive factors. It does not record irreversible changes such as gingival recession or loss of periodontal attachment.

Primarily, CPITN is a screening procedure for identifying actual and potential problems posed by periodontal diseases both in the community and in an individual. With this information appropriate oral care services can be planned for populations and for individuals. Decisions on priority use of resources and the actual type of periodontal care services to be provided will be dependent upon social, economic, availability of personnel and facilities and other factors. The magnitude of the treatment needs obtained through CPITN surveys will provide an essential basis for planning and promoting primary health care programmes and for the monitoring of such programmes (**Cutress *et al.* 1987**).

3 LITERATURE REVIEW

3.1 INTRODUCTION

The Community Periodontal Index of Treatment Needs (CPITN) has generated a lot of interest among epidemiologists and clinicians throughout the world since it was accepted as an index for assessing periodontal treatment needs in 1981. Investigators have extended its usage for prevalence studies of periodontal diseases (*Grytten et al. 1989*), and for monitoring and screening individual dental patients (*Sivaneswaran and Barnard 1987*).

The validity and reliability of the partial mouth examinations of the CPITN for assessing periodontal treatment needs, prevalence of periodontal diseases and disease severity have been critically assessed by various investigators. The choice of the ten index teeth in the CPITN has been compared with the six Ramfjord teeth to assess the reliability of partial mouth recordings of the two systems. Comparison with other indices has also been done to assess the relative advantages and disadvantages of the indices.

The survey results using the CPITN for assessing periodontal treatment needs and the prevalence of periodontal diseases from many countries throughout the world are stored in the WHO Global Oral Data Bank at the WHO Headquarters in Geneva. Analyses of these data have provided a general overview of the periodontal profiles in regions and countries throughout the

world (Pilot *et al.* 1986; Pilot *et al.* 1987; Miyazaki *et al.* 1991a; Miyazaki *et al.* 1991b; Miyazaki *et al.* 1992; Pilot *et al.* 1992).

The CPITN data on the periodontal conditions of the adolescents and adult populations in Malaysia were obtained from the Dental Epidemiological Survey of Adults in Malaysia 1990-1991 (Ministry of Health, Malaysia 1993a). The data had enabled some comparisons to be made on the periodontal profiles in the country with the global profiles and the periodontal profiles of some other countries in the Western Pacific Region of the WHO.

3.2 PERIODONTAL INDICES

Indices Of Periodontal Disease are defined as measurements which express numerically the status of a group with respect to the disease. They can be used to measure prevalence or incidence of the disease. They can also be used to measure the severity of a disease ranging from its absence to its terminal stages (**Davies 1968**).

Periodontal Disease is a general term which is used to denote any disease peculiar to the periodontium or parts thereof, regardless of the aetiology (**WHO 1978**).

3.2.1 General Requirements of an Index

Davies (1961) stated that certain requirements are common to all indices.

These are:

1. It should be simple to use and should permit the study of a large number of persons in a minimum time and at a minimum cost.
2. The criteria which define the components of an index should be clear, readily understandable and promote diagnostic reproducibility both within and between examiners.
3. It should be amenable to statistical analysis.
4. If it is used to describe severity, the index should be equally sensitive throughout the scale and should indicate in a meaningful way the clinical stages in the disease process.

3.2.2 Objectives of a Periodontal Index

Ramfjord (1959) stated that the objectives of a scoring system or an index for periodontal disease are:

1. To map distribution of the disease (prevalence).
 - a. In population group
 - b. Within each dentition
 - c. Around each individual tooth (mesial, distal, buccal, lingual).
2. To record the progress and behaviour of the disease either by longitudinal studies of the same group or by comparing prevalence studies of various age groups within the same population (incidence).
3. To serve as a basis for evaluation of the role of various etiological factors in the pathogenesis of periodontal disease.
4. To allow an estimate of total needs for periodontal therapy in population groups.
5. To acquire a basis for education of the dental profession, the public, and the governmental authorities regarding the need for attention and treatment of periodontal disease; to estimate future needs for dentists and auxiliary personnel.
6. To serve as a basis for the testing and evaluation of various procedures for periodontal treatment.
7. To serve as a basis for evaluation of effectiveness of various measures for preventing or delaying the loss of teeth due to periodontal disease.
8. To serve as a basis for evaluation of measures to prevent periodontal disease.

3.3 ASSESSMENT OF CPITN

Since its adoption as an index for assessing periodontal conditions and for assessing the resultant treatment needs in 1981, the Community Periodontal Index of Treatment Needs (CPITN) has been subjected to extensive reviews by various workers, regarding its validity, reliability, and its applicability. Some workers explored its adaptability for other uses in clinical practice.

3.3.1 Reliability of CPITN

A number of investigators have attested to the reliability of the CPITN in epidemiological studies for the assessment of periodontal treatment needs (**Ainamo *et al.* 1984; Sivanewaran 1985; Cutress *et al.* 1986; Cutress *et al.* 1987; Miller *et al.* 1991**). Essentially, they concluded that the CPITN methodology is a simple, reliable and appropriate procedure for assessing periodontal treatment needs in population groups.

Compared with other epidemiological indices, the CPITN is not only simple and practical but also more objective in its choice of clinical criteria and methodology. In particular the data offer rapid appreciation of the periodontal conditions of a population and their treatment needs and personnel required (**Cutress *et al.* 1987**). Sivanewaran (1985) stated that the CPITN was a meaningful and practical index for recording various periodontal conditions and for assessing the consequent treatment needs.

In a comparative study to assess the relative advantages and disadvantages of the Periodontal Index (PI) and the CPITN, Cutress *et al.* (1986) found that the CPITN identified higher proportions of adults and teeth with a healthy periodontal condition and also those with periodontitis than the PI (which requires the examination of all teeth). The proportion of adults and teeth with gingivitis as the worst condition was greater than when assessed by the PI. Evaluation of individual adult scores by PI and CPITN suggested that the CPITN, despite being a partial recording index only, is more sensitive in identifying existing periodontal conditions and treatment needs than the PI. It was recommended that the CPITN be used for epidemiological screening procedure in preference over PI.

In another comparative study involving the WHO (1977) index and the CPITN index, Sivaneswaran (1985) stated that the WHO (1977) index tended both to under-estimate and to over-estimate the severity of periodontal disease when compared to the CPITN. This was because the criteria used for measuring periodontal status and translating them into treatment needs using the WHO (1977) index were found to be subjective, less appropriate and less scientific when compared to the CPITN index. She concluded that the CPITN index was definitely a superior index for screening of treatment needs when compared with the WHO (1977) index.

The reliability of the partial mouth recording in the CPITN methodology was evaluated and tested by a number of investigators (**Ainamo *et al.* 1984; Sivaneswaran 1985**). Ainamo *et al.* (1984) found that the presence of calculus was assessed equally well by examination of the index teeth in each sextant and by examination of all teeth for determination of the sextant score. Gingival bleeding, however, was observed more often in the maxillary anterior sextant by full mouth examination than by examination of the index tooth (11) alone. Due to the high prevalence of gingival bleeding in young subjects, they suggested that for identification of treatment priorities, examination of specified index teeth was of greater value than full mouth examinations.

Sivaneswaran (1985) stated that partial mouth recording using 10 index teeth was sufficient for use as a screening examination and for epidemiological surveys. Partial mouth recording using four separate probings of the 10 index teeth gave a good assessment of the full mouth appraisal of periodontal conditions of patients. Four probings of the 10 index teeth (mesial and distal interproximal areas of the buccal and lingual surfaces) appeared to be ideal for a screening examination. However, she also found that two probings of the 10 index teeth gave a *reasonable* assessment of the full mouth periodontal condition and could be used for epidemiological surveys.

3.3.2 Weaknesses of CPITN

Two principal weaknesses of CPITN were identified, namely the tendency of the CPITN to over-estimate the need for scaling especially in the younger age groups (Gaengler *et al.* 1988; Grytten *et al.* 1989), and its tendency to under-estimate the need for complex periodontal therapy in the older age groups of the population (Ainamo and Ainamo 1985; Gaengler *et al.* 1988; Miller *et al.* 1990).

Another area of interest among investigators is the use of partial mouth recording in CPITN methodology as opposed to a full mouth recording. In their study involving the two recording systems, Ainamo and Ainamo (1985) concluded that partial mouth examination is not accurate enough for the determination of periodontal treatment needs of individual patients. Although they found that the partial mouth examination procedures of the CPITN gave acceptable estimates of the number of subjects needing oral hygiene education and scaling, Miller *et al.* (1990) concluded that the CPITN is more accurate using full mouth examinations due to the fact that selected teeth cannot invariably represent the full mouth. Kingman *et al.* (1988) have shown that the partial mouth examination procedures produce serious bias no matter which index is used.

When it is used for assessing the average severity scores, the CPITN scores obtained from partial mouth recording, exceeded those obtained by full mouth examinations for all indicators. The prevalence figures were higher

than those based on the six Ramfjord teeth (Ainamo and Ainamo 1985).

Consideration of published data has revealed several problems associated with the recording of the presence of calculus. The first is that no distinction is made between supra- and subgingival calculus despite the fact that the removal of subgingival calculus is more time-consuming and more difficult than the removal of supragingival calculus (Takahashi *et al.* 1988). Sivanewaran (1985) also stated that it was necessary to record supra- and subgingival calculus separately so as to obtain a greater accuracy in estimating the treatment times for the two conditions.

The second problem is that in the CPITN methodology, no distinction is made between the presence of calculus with and without bleeding. Ainamo *et al.* (1982) stated that, in their field trials, there was a significant relationship between bleeding and supragingival calculus. They also stated that for evaluation of treatment needs, recording of plaque was considered less important than the assessment of its consequences: gingival bleeding and pocket formation. In the CPITN methodology the recording of pockets (codes 3 and 4) takes precedence over calculus, and calculus (code 2) takes precedence over bleeding (code 1) (Takahashi *et al.* 1988). Thus the validity of the hierarchical scoring system of the CPITN has also been doubted and subjected to extensive tests by some investigators.

In order to be valid for describing the periodontal conditions hierarchically, a tooth with CPITN code 2 (calculus) should also demonstrate gingivitis.

However there are two possible combinations for code 2, namely:

- i. calculus + bleeding
- ii. calculus - bleeding (this combination is not taken into account in the hierarchial system of CPITN for code 2).

For codes 3 and 4 the following combinations of pockets, calculus, and gingivitis are possible:

- i. pocket - calculus - bleeding
- ii. pocket + calculus - bleeding
- iii. pocket + calculus + bleeding
- iv. pocket - calculus + bleeding.

In order to be valid for describing the periodontal conditions hierarchically only the third combination (pocket + calculus + bleeding) is taken into account in the CPITN methodology (Grytten *et al.* 1989).

Takahashi *et al.* (1988) found that 38-52 per cent of the sextants given code 2 showed no bleeding after probing in a study of the periodontal status of 257 Japanese company employees aged 20-56 years. In a similar study involving 4047 persons aged 13 years and over in Norway, Grytten *et al.* (1989) found that 15 per cent of all sextants with code 2 exhibited no bleeding after probing.

These findings were supported by Holmgren and Corbet (1990) who found that 28.2 per cent of the sextants with calculus without pocket (code 2) exhibited no bleeding in a sample of 563 youths aged 15-19 years in Hong Kong. In the same study 23.9 per cent of the sextants with calculus (code 2) in a sample of 668 adults aged 35-44 years exhibited no bleeding.

The above findings cast serious doubt about the assumption of the CPITN that there is a close concordance between calculus and periodontal inflammation (Holmgren and Corbet 1990). Toothbrushing alone has been shown to produce a reduction in gingival bleeding in subjects with large amounts of calculus (Garre *et al.* 1990). Holmgren and Corbet (1990) cast further doubt about the basis for CPITN advocating scaling for all teeth with calculus.

3.3.3 Shortcomings of CPITN

While the perpetrators of CPITN took great efforts to explain the detail utilisation of the index for calculating and assessing the magnitude of periodontal problems and their resultant treatment needs, no specific guidelines were given for the calculation of manpower requirement. This very important area has never been seriously explored in relation to CPITN.

Ainamo *et al.* (1982) suggested that an alternative way to present the results of CPITN findings was to report the average time needed to carry out the procedures in the various treatment categories. They further suggested that

the time estimates be assessed locally. They reported that suitable procedures were being tested and more detailed recommendations would be developed. However, up to date no specific guidelines have been developed for the calculation of workforce in relation to CPITN.

Only a few investigators have tried to utilise the results of epidemiological surveys using the CPITN index for the calculation of manpower requirement. However, apart from the times estimates based on the WHO recommendations in the WHO TRS 621 (**WHO 1978**) only a few workers have attempted to find alternative guidelines for the estimation of treatment times in relation to CPITN.

Manji and Sheiham (1986) calculated the workforce implications of CPITN survey results for the treatment of periodontal diseases using the time estimates based on the WHO recommendations (**WHO 1978**) in the following ways:

1. conversion of the quadrant times of WHO (1978) into sextant times;
2. calculation of total treatment times for the treatment procedures for each age group using the sextant time estimates;
3. calculation of workforce requirement for the treatment of periodontal diseases based on the total treatment times.

They reported that the total number of manpower obtained using these methods far beyond the manpower resources of any country. This is due to the fact that while CPITN index, as the name implies, is a community index,

the manpower calculations were done on a one-to-one basis between a dentist and his patient.

Zimmerman *et al.* (1990) in their clinical studies on the Chilean and Polish refugees in Sweden found that the mean treatment times for each category of periodontal therapy were as follows:

- | | | |
|------|------------------------------|----------------|
| i. | Oral hygiene instruction | 60 min/person |
| ii. | Scaling | 20 min/sextant |
| iii. | Complex treatment or surgery | 40 min/sextant |

They did not give any specific times estimates for each age group for carrying out the treatment procedures. In these studies the mean individual treatment times for the Chilean refugees was 141 ± 44 minutes (mean $\pm$ SD) and 132 ± 50 minutes for the Polish refugees.

These findings differ greatly from the finding by Butterworth and Sheiham (1991) who observed that the treatment times for periodontal diseases in a general practice set up was only 14.7 minutes per patient, which was much lower than the time estimates from the WHO guidelines (WHO 1978). They contended that the WHO guidelines would over-estimate the actual time taken by practitioners to treat periodontal diseases. However, they cautioned that further studies should be carried out before the CPITN could be used for estimating treatment needs and manpower staffing requirements.

3.4 PERIODONTAL PROFILES ASSESSED USING CPITN

The results of CPITN surveys which are stored in the WHO Global Oral Data Bank in the WHO Headquarters in Geneva, have been assembled and analysed by various groups of experts. The results obtained from these analyses revealed specific patterns of periodontal diseases found in the adolescents, adults and in the older age cohorts.

Results from the Malaysian survey of the adult population in the country (**Ministry of Health, Malaysia 1993a**) is compared with the global profiles and with the results of other studies in the region.

3.4.1 Periodontal Conditions in Adolescents

In an analysis of 61 survey results from 39 countries, Pilot *et al.* (1987) found that the most frequently observed condition was the presence of calculus (code 2). Some shallow pocketing of 4 or 5 mm (code 3) was also present in most of the populations surveyed. In their analysis of CPITN data from 100 surveys conducted in 60 countries, Miyazaki *et al.* (1991a) also found that the calculus was the most prevalent periodontal condition, and it was much more prevalent in non-industrialised countries than in industrialised countries.

3.4.2 Periodontal Profiles of Adults

In an analysis of the results of 100 CPITN surveys of adults aged 35-44 years from more than 50 countries, Miyazaki *et al.* (1991b) found that the most frequently observed conditions were calculus and shallow pocketing. With a few exceptions, the percentage of persons and the mean number of sextants per person with deep pockets were small to very small. These findings support the earlier findings by Pilot *et al.* (1986). The assumed difference between industrialised and non-industrialised countries with regard to periodontal health in the adult populations were not reflected in the survey data examined (Miyazaki *et al.* 1991b).

Severe periodontal destruction seems to be a limited problem, seldom leading to tooth loss before the age of 50. For the large majority in most of the population observed, the progress of periodontal diseases seems to be compatible with the retention of natural dentition into old age (Pilot *et al.* 1986, Miyazaki *et al.* 1991b). Nevertheless, the periodontal problem is of considerable magnitude and importance, as 5-20 per cent of the populations are affected by a serious, irreversible condition (code 4) at the age of 40, which is a high percentage compared with almost every other disease that affects mankind (Miyazaki *et al.* 1991b).

3.4.3 Periodontal Profile of The Older Age Cohorts

In their analysis of more than 80 CPITN survey results from almost 30 countries for three age groups of 45-54, 55-64 and 65-74 years, Pilot *et al.* (1992) found some interesting facts about the periodontal conditions of these age groups. Firstly, the assumed difference between industrialised and non-industrialised countries with regard to periodontal diseases did not show in the data examined. Secondly, the expected increase in periodontal destruction with increasing age was not reflected in the values for pocketing in successive age groups. It was suggested that the progress of periodontal destruction with age was reflected in the increase in the number of excluded CPITN sextants.

Some variations between surveys were also noted for the rate of tooth loss, expressed in terms of the mean number of excluded sextants. On average, at age 50, almost one sextant was excluded, increasing from 1.5 sextants at age 60 to 2.5 at age 70. For the age group 65-74 years, this results in, on average, almost half of all sextants being excluded. Of the remaining sextants, approximately half had shallow and/or deep pockets (Pilot *et al.* 1992).

3.4.4 Periodontal Profiles in Malaysia

Results of the Dental Epidemiological Survey of Adults in Malaysia 1990-1991, highlighted some features about the profiles of periodontal disease conditions in the country (**Ministry of Health, Malaysia 1993a**).

Calculus was the most common periodontal condition in all age groups with a prevalence of 68.5 per cent in adolescents aged 15-19 years, 60.6 per cent among adults aged 35-44 years, and 54.5 per cent in the old age cohort aged 65 years and above.

The prevalence of calculus in the adolescents aged 15-19 years (68.5 per cent) is significant since the oral health goal for periodontal diseases in the WHO Western Pacific Region has been set at 25 per cent or less of the population aged 15-19 years with a CPITN code 2 (**WHO 1984**). There is thus a need for Malaysia to set its own realistic goal since it is unlikely that the WHO periodontal health goal for the region will be achieved in the country by the year 2000.

The adolescents in Malaysia seemed to have better periodontal health than their counter-parts in Hong Kong, Japan and Philippines but not as good as those in Fiji. The prevalence of calculus in the adolescents is similar to those found in two other countries in the WHO Western Pacific Regional Organisation (WPRO), namely Japan (68 per cent) and China (68 per cent). While in the adults, the finding was similar to the prevalence in Philippines

where 60 per cent of the adults were found to have calculus (**Miyazaki, Pilot & Leclercq 1992**).

Shallow periodontal pocketing was found in only 3.9 per cent of the adolescents but it increased to 23.4 per cent in adults aged 35-44 years, and it was found in a quarter or more of the older adults in the country (**Ministry of Health, Malaysia 1993a**). In the Western Pacific Region most of the other countries exhibited a higher prevalence of shallow periodontal pockets (**Miyazaki, Pilot & Leclercq 1992**).

Deep periodontal pockets were found mainly in those above the age of 30 years, with a prevalence of 4.3 per cent which increases with increasing age to 16.4 per cent in those aged 65 years and over.

In a different study by Abdul-Kadir (1990) on urban West Malaysian adolescents aged 16 years, she found that 67.1 per cent had healthy periodontium, and 30.9 per cent had calculus with a mean number of sextant of 0.6. These findings differ from those found in the national survey where the prevalence of calculus for urban adolescents was 61.2 per cent, and only 20.2 per cent had healthy periodontium (**Ministry of Health, Malaysia 1993 a**).

The findings obtained in the previous adult survey done in 1974-1975 (**Ministry of Health, Malaysia 1977**), showed that 72.4 per cent of the

adults had periodontal diseases. However, no direct comparison between these findings and those obtained from the adult survey in 1990-1991 can be made because different indices were used in the two surveys.

The mean number of teeth retained at the ages of 65 years and above has increased from 7.5 in 1975 to 11.6 in 1991.

More detailed descriptions of the periodontal conditions of the adolescents and adult populations in Malaysia assessed using the CPITN index will be presented in **Chapter 4**.

4 PERIODONTAL PROFILES IN MALAYSIA

4.1 INTRODUCTION

The Dental Epidemiological Survey of Adults in Malaysia was carried out from October 1990 to January 1991. A total of 13 740 subjects aged 15 years and over were examined. Out of this total number of subjects, 12 305 were dentate. The periodontal conditions of the dentate subjects were assessed using the CPITN Index (Ministry of Health, Malaysia 1993a).

The subjects were categorised into four variables, namely age groups, ethnic groups, gender, and by urban or rural area. The age groupings used in the survey were 15-19 years, 20-24 years, 25-29 years, 30-34 years, 35-44 years, 45-54 years, 55-64 years, and 65 years and above. In the further analyses of the survey results in this chapter, three age groups, namely 15-19 years, 35-44 years, and 65 years and above, as recommended by WHO (1987) are used in discussing disease prevalence and treatment needs, and all age groups will be used to assess the trend of disease progression with age. The subjects were divided into five ethnic groups, namely Malay, Other Bumi (Other Indigenous), Chinese, Indian/Pakistani, and Others. In the discussion on the further analyses of the survey results, the Others are excluded because of their comparatively small number.

The initial analyses of the survey results (**Ministry of Health, Malaysia 1993a**) revealed the following findings about the periodontal conditions of the adolescents and adult populations of Malaysia:

- i. Only 7.2 per cent of the subjects examined had no periodontal disease. Generally the percentage of subjects without periodontal disease decreases with age from 16 per cent for 15-19 age group to 1.7 per cent for 55-64 age group.
- ii. Females showed better periodontal health compared with males, with 8.2 per cent of females with no periodontal conditions and only 6 per cent for males. Pocketing was found in 25 per cent males and 20.6 per cent females.
- iii. The urban population had better periodontal status than those from the rural areas. The survey showed that 9.7 per cent of the urban population had no periodontal diseases compared with only 5.8 per cent of their rural counter-parts.
- iv. Calculus as the highest score was the most prevalent condition detected in all ethnic groups. It was found in 65.1 per cent of the subjects examined with a mean of 3.2 sextant affected. Similar prevalence was detected in all ethnic groups.
- v. Periodontal pocket of 4-5 mm deep was observed in 17 per cent of the subjects with a mean of 0.5 sextants affected. Deep periodontal pocket of 6 mm or more was observed in only 6 per cent of the subjects with a mean of 0.1 sextant affected.
- vi. It was shown that 92.8 per cent of the subjects required oral hygiene instruction (TN 1), 88.1 per cent scaling (TN 2), and only 6 per cent needed complex periodontal therapy (TN 3).
- vii. Among the males subjects 89.9 per cent required scaling with a mean of 3.5 sextants involved, compared with 86.7 per cent of females with a mean of 3 sextants involved. Complex periodontal treatment was required by 7.4 per cent of males and 4.4 per cent of females.

The author feels that more detailed analyses of the survey results regarding the periodontal disease conditions are necessary in order to obtain a clearer and more comprehensive picture of the periodontal status in the country, which will enable comparative studies with the results of surveys from other countries. For international comparison the periodontal profiles of three age groups, namely 15-19 years, 35-44 years, and 65 years and above will also be discussed.

The objective of this chapter is to conduct further analyses on the results of the Dental Epidemiological Survey of Adults in Malaysia 1990-1991 regarding the periodontal disease conditions in order to obtain more comprehensive profiles of the periodontal disease status of the adult populations in Malaysia, including their treatment needs.

4.2 FURTHER ANALYSES OF THE SURVEY RESULTS

The results of the Dental Epidemiological Survey of Adults in Malaysia 1990-1991 on the periodontal disease conditions and their resultant treatment needs are presented in **Appendices 1 to 11.** In order to conduct further analyses on the survey results, the data are presented in bar graphs or line graphs. Three aspects of the periodontal diseases will be discussed, namely the prevalence, the severity (specified by mean number of affected sextant or MNS), and their treatment needs (TN). These aspects will be categorised into four parameters, namely age groups, gender, ethnic groups, and area (urban/rural).

4.2.1 Prevalence of Periodontal Disease

The Community Periodontal Index of Treatment Needs (CPITN) has been extensively used for assessing periodontal health status throughout the world. The results of dental epidemiological surveys using the CPITN for assessing the prevalence of periodontal diseases and their treatment needs are compiled and stored in the WHO Global Oral Data Bank. From the overviews of these data certain specific patterns of periodontal diseases throughout the world could be deduced.

In order to obtain the prevalence of the periodontal diseases, the percentage of persons with the highest score for each periodontal condition is taken: H (score 0) for healthy, B (score 1) for bleeding or gingivitis, C (score 2) for

calculus, P1 (score 3) for shallow pockets of 4-5 mm deep, P2 (score 4) for deep pockets of 6 mm or more.

4.2.1.1 Prevalence of Periodontal Disease by Age Group

The survey showed that the percentage of subjects who were found to have no periodontal conditions decreased with age from 16.9 per cent among the adolescents aged 15-19 years, to 4.6 per cent at 35-44 years, and 1.7 per cent of those aged 55-64 years (**Figure 5**). It was observed that there was an increase in the percentage of persons with healthy periodontium from 1.7 per cent among those aged 55-64 years to 4.2 per cent among those aged 65 years and over. This could be due to an increase in tooth loss after 64 years of age as shown by a lesser mean number of teeth in the older age group (**Figure 26**).

Dental calculus was the most frequently observed condition in all age groups, affecting 68.5 per cent of the 15-19 year-olds, 60.6 per cent of those aged 35-44 years, and 54.5 per cent of old age cohorts aged 65 years and over. The apparent decrease in prevalence of calculus with age was due to a corresponding increase in the prevalence of shallow and deep periodontal pocketings which were found in 31.9 per cent of adults aged 35-44 years, and 40.7 per cent of the old age cohorts (**Figure 6**), with increasing severity with age. Pocketings were seen in a mean of 0.7 sextants (MNS 0.7) in 35-44 age group and 0.9 sextants (MNS 0.9) in those aged 65 years and over (**Figure 24**).

The prevalence of shallow periodontal pocket of 4-5 mm increased with age from 3.9 per cent at 15-19 years to 26.7 per cent of older aged group of 55-64 years (**Figure 7**). The apparent drop in prevalence of shallow pocket from 26.7 per cent of the 55-64 years group to 24.3 per cent of the old aged cohort 65 years and over might be due to a corresponding increase in prevalence of deep pocket from 13.4 per cent to 16.4 per cent over the same age range, or it could be due to an increase in tooth loss, represented by an increase in the mean number of edentulous sextants (**Figure 25**) which will be discussed later. But despite the drop in prevalence of shallow pocket, the severity increased from a mean of 0.8 affected sextant (MNS 0.8) in the 55-64 age group to 0.9 sextant (MNS 0.9) in those aged 65 years and over (**Figure 24**).

The prevalence of deep pocket of 6 mm or more in depth also increased with age from 0.3 per cent at 15-19 age group to 8.5 per cent (MNS 0.2) of the 35-44 age group, and 16.4 per cent (MNS 0.3) of the old age cohort aged 65 and over. The mean number of affected sextants are shown in **Figure 24**.

Figure 5

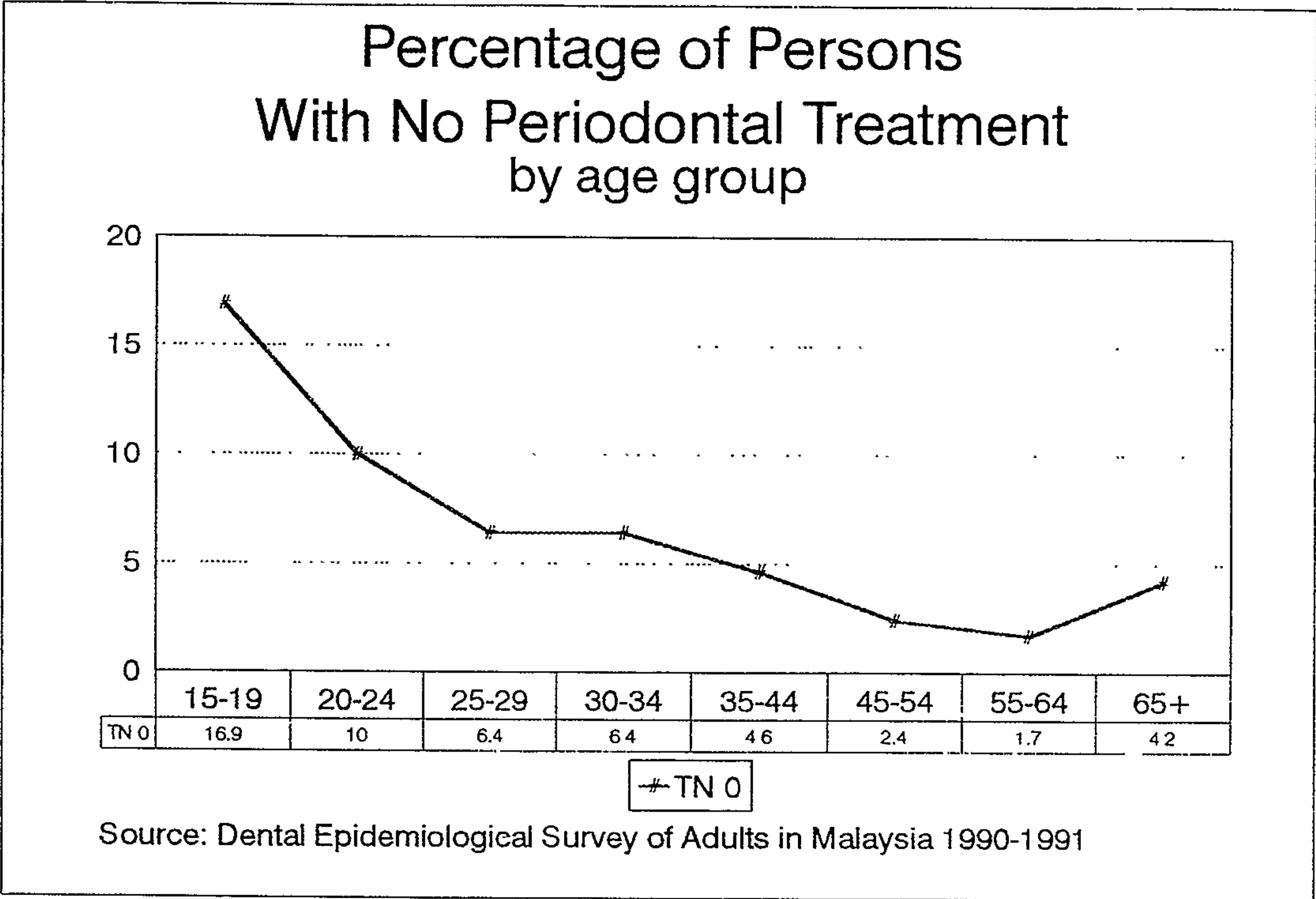


Figure 6

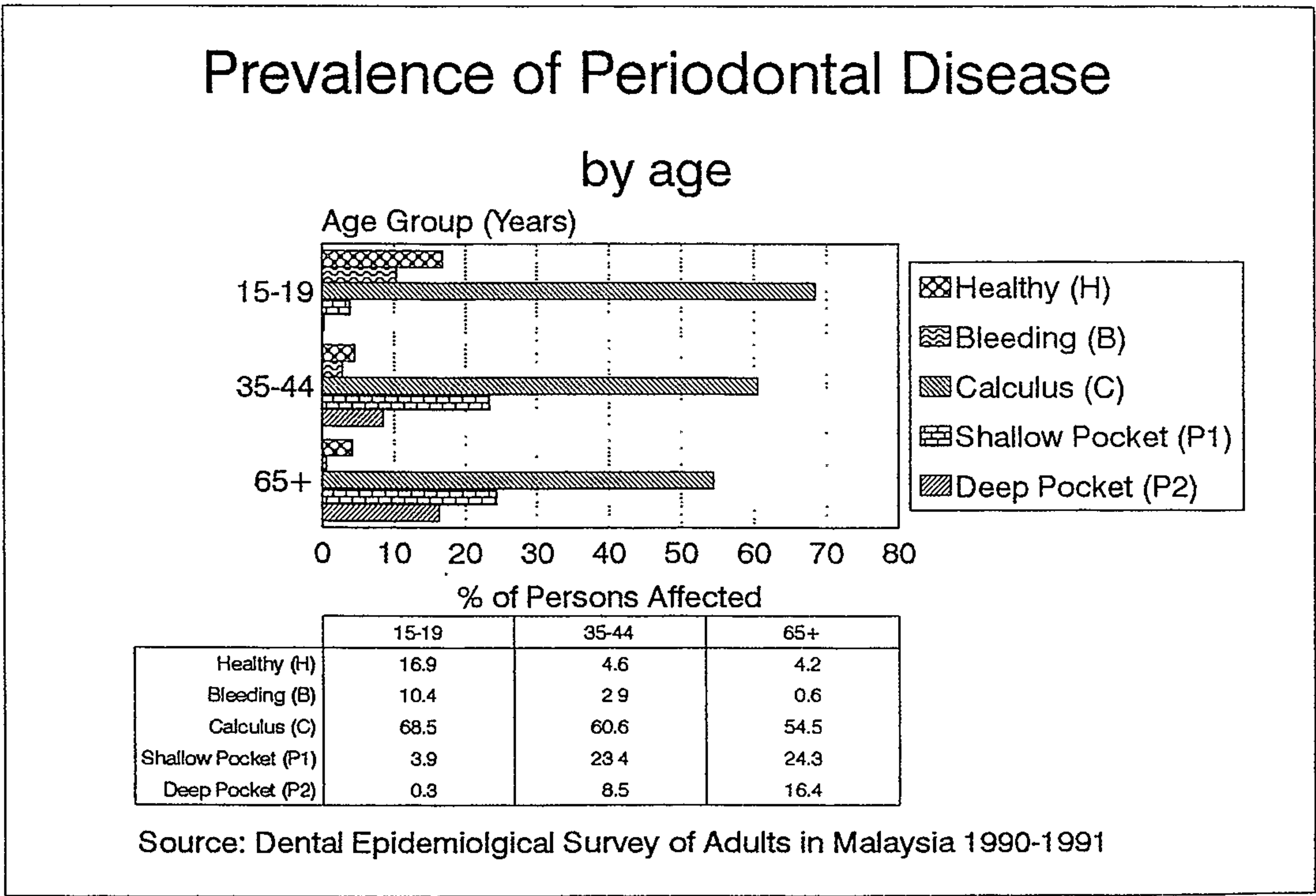
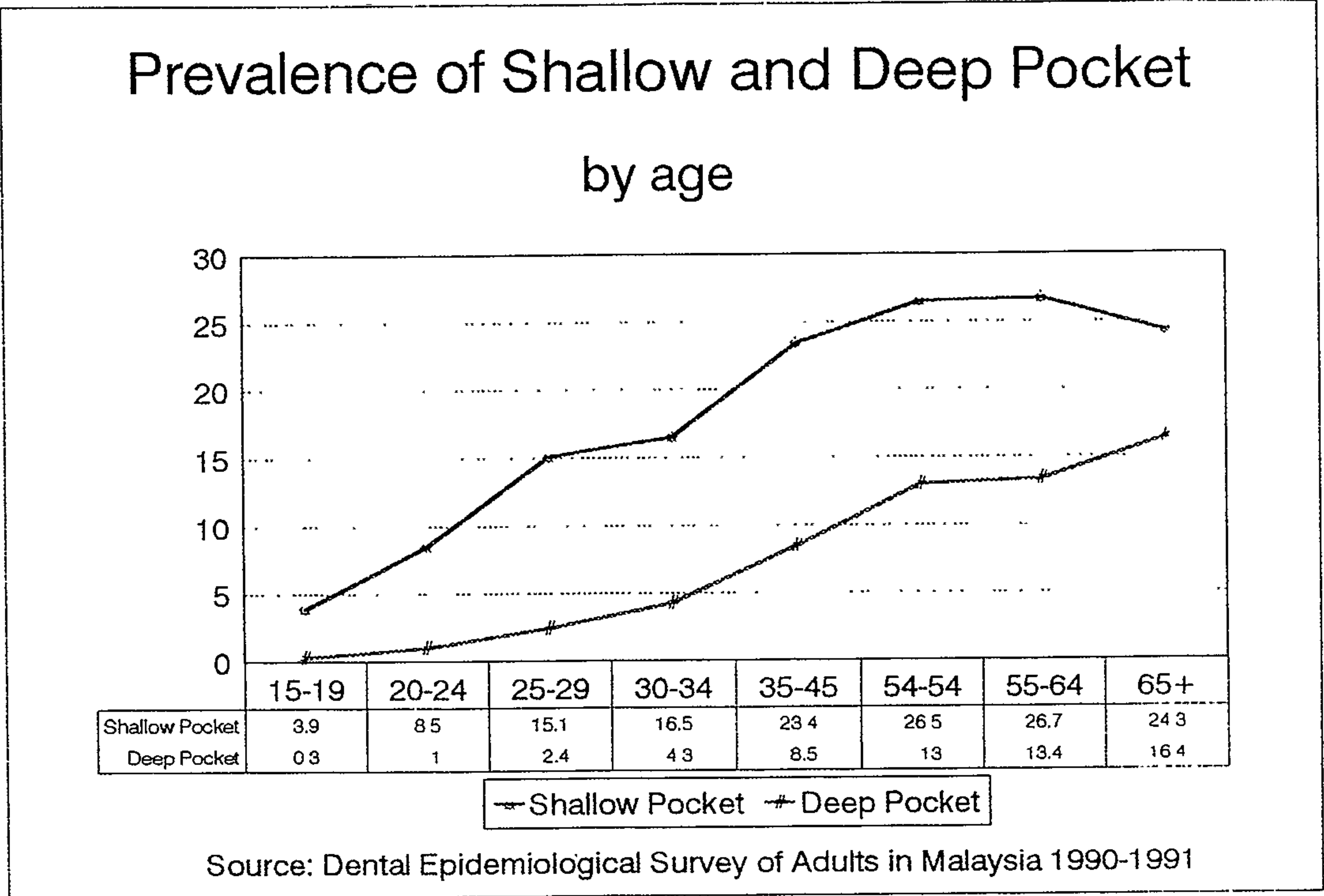


Figure 7



4.2.1.2 Prevalence of Periodontal Disease by Ethnic Group

Figure 8 shows that the Indian/Pakistanis were observed to have better periodontal conditions at younger age groups up to the age of 29 years, since more of them had no periodontal conditions compared with the other ethnic groups. The Other Bumis were observed to have the least percentage of population with healthy periodontium up to the age of 44 years compared with the other ethnic groups. From the age of 30 to 54 years the Chinese were observed to have better periodontal health than the other ethnic groups.

Figure 9 shows the prevalence of shallow periodontal pocket by age group and ethnic group. The Other Bumis showed a noticeably higher prevalence of shallow pocket at all age groups compared with the other ethnic groups. However after the age of 35 years the Indian/Pakistanis showed a marked increase in the prevalence of deep pocket of 6 mm or more from 10.1 per cent (MNS 0.1) at age group 35-44 to 33.3 per cent (MNS 0.9) among the old age cohort aged 65 years and above (Figure 10).

Figure 8

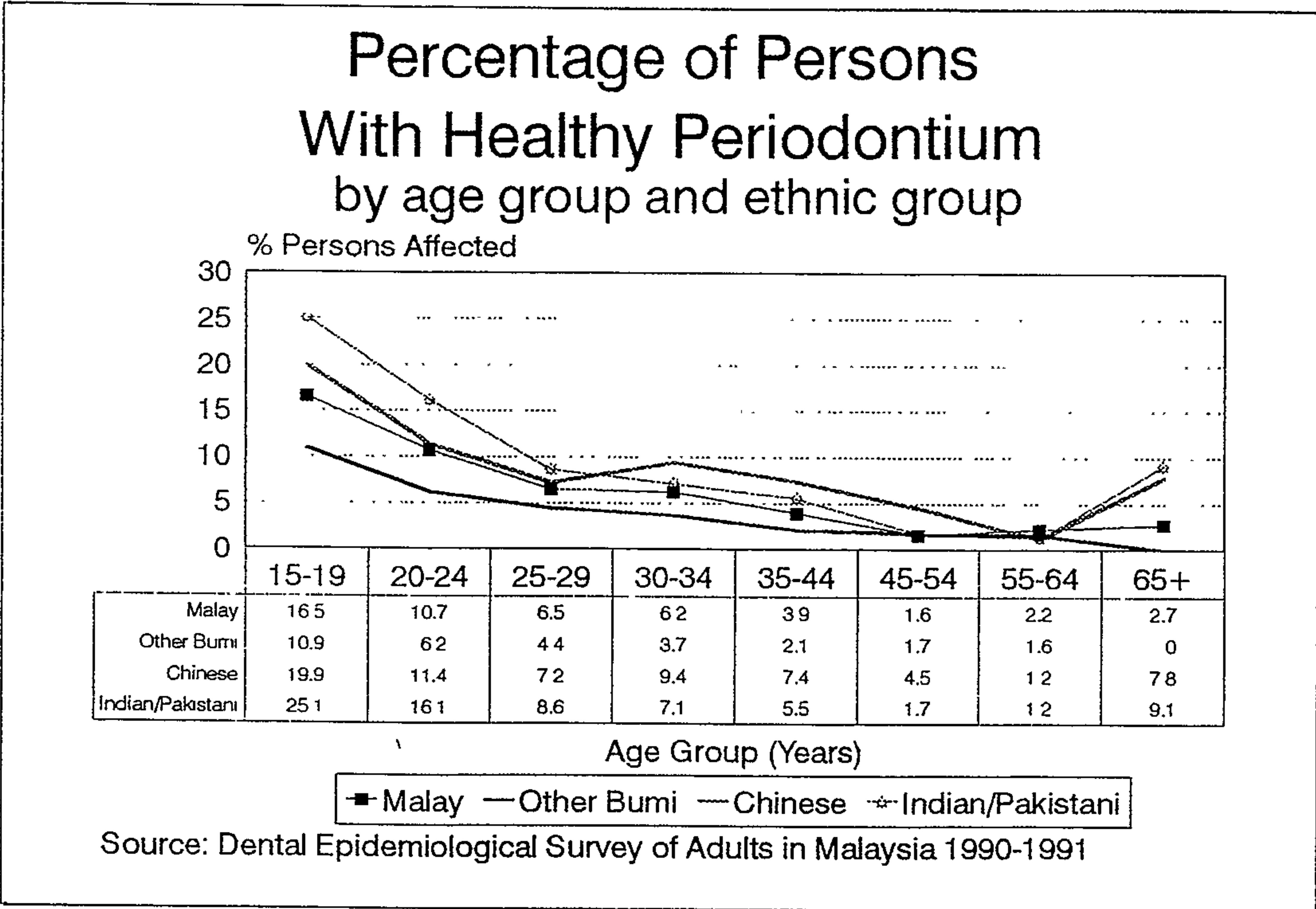
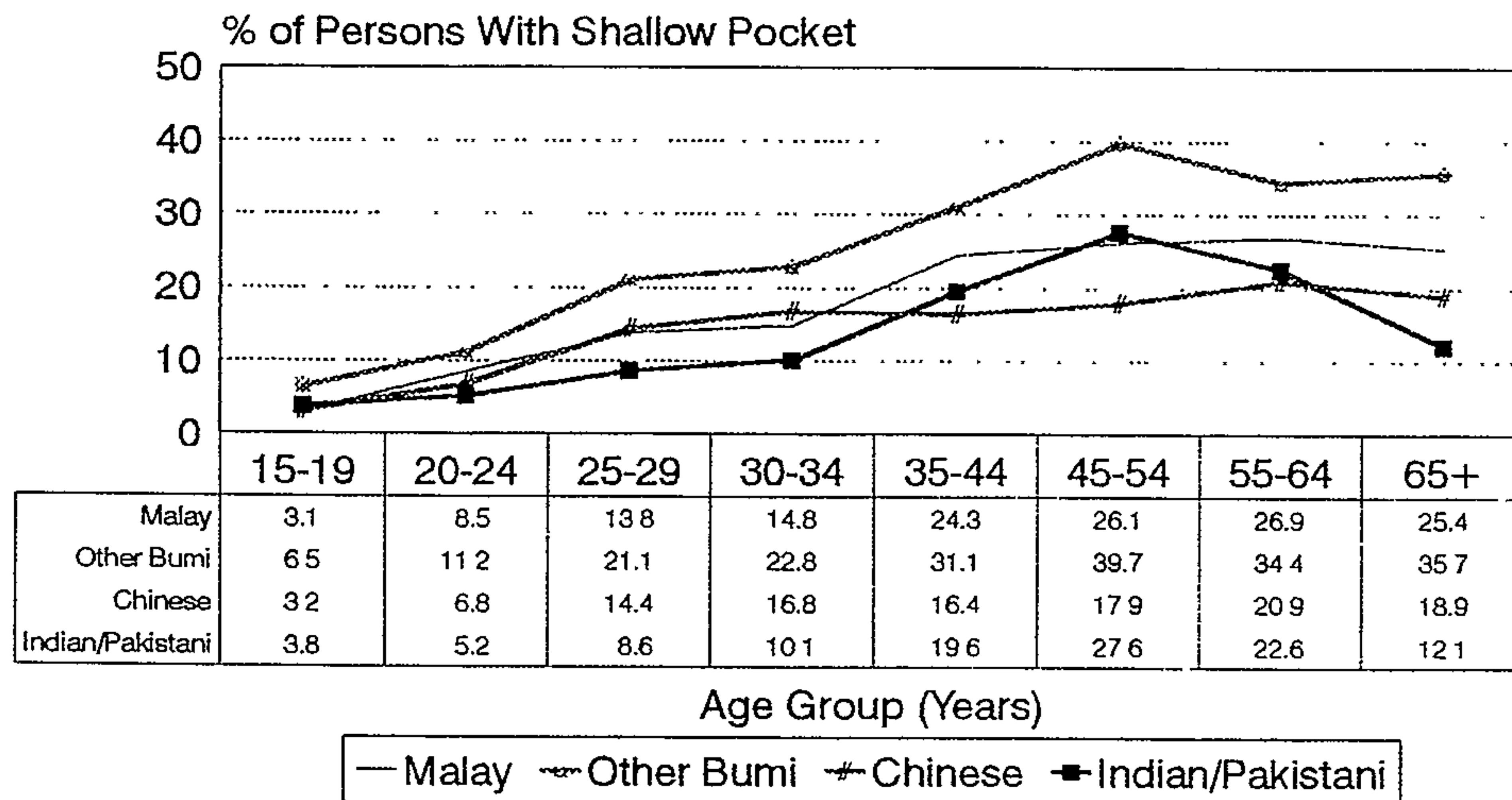


Figure 11 shows the periodontal conditions of the Malays at age groups 15-19, 35-44, and 65 and over. The figure shows that calculus was the most frequently observed periodontal condition in all age groups, and it seemed

Figure 9

Prevalence of Shallow Pocket

by age group and ethnic group

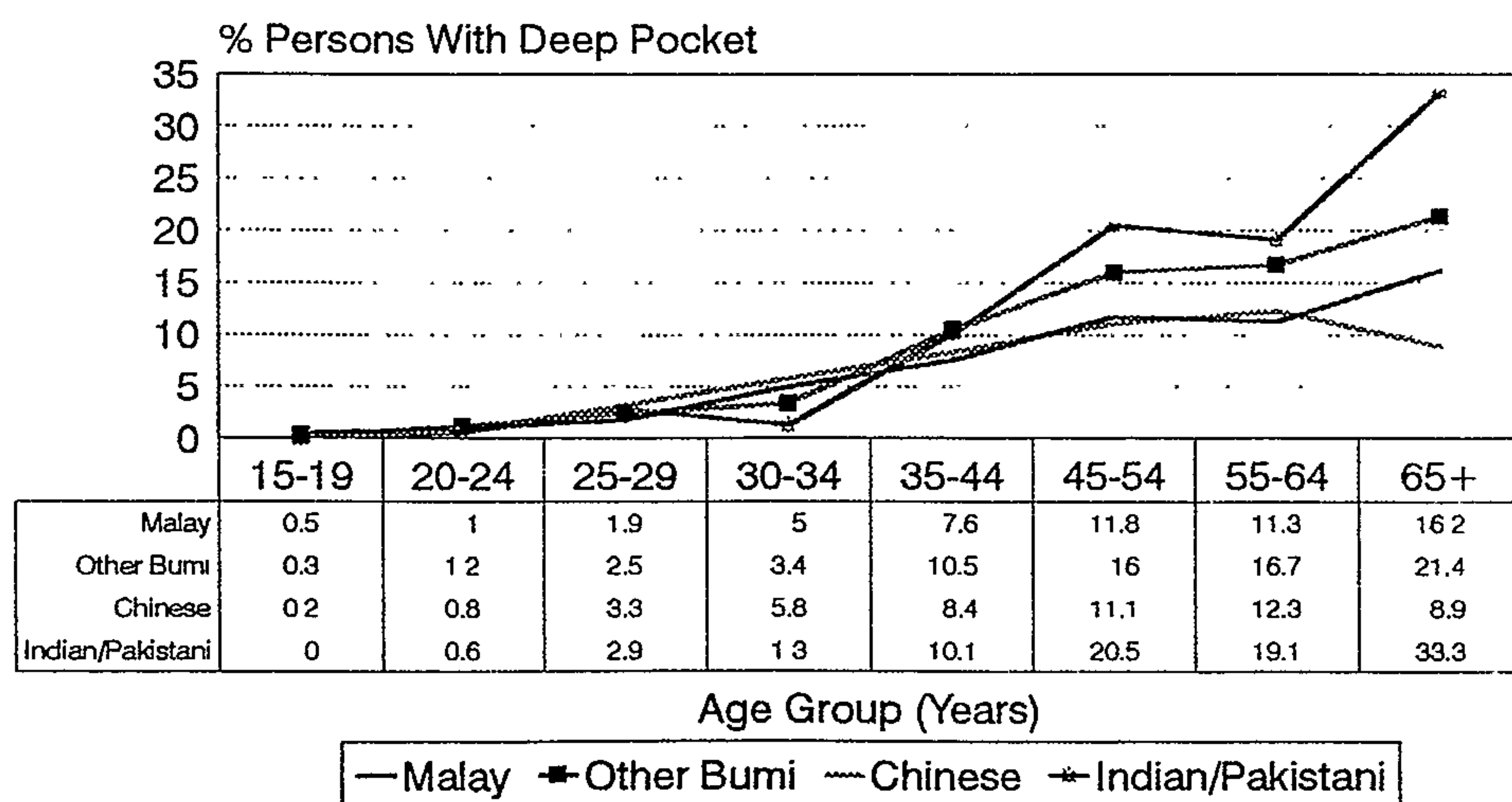


Source: Dental Epidemiological Survey of Adults in Malaysia 1990-1991

Figure 10

Prevalence of Deep Pocket

by age group and ethnic group



Source: Dental Epidemiological Survey of Adults in Malaysia 1990-1991

Figure 11

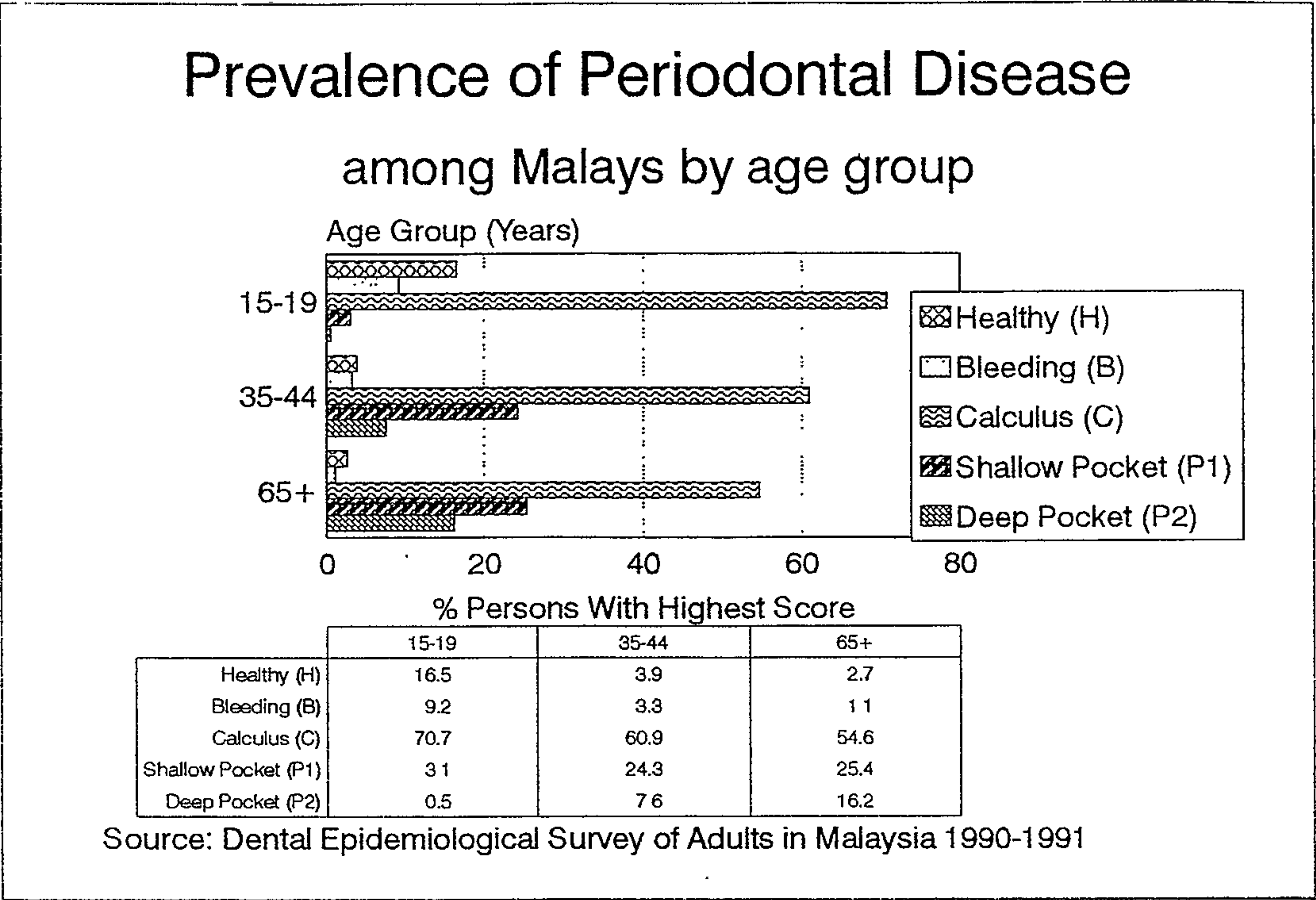


Figure 12

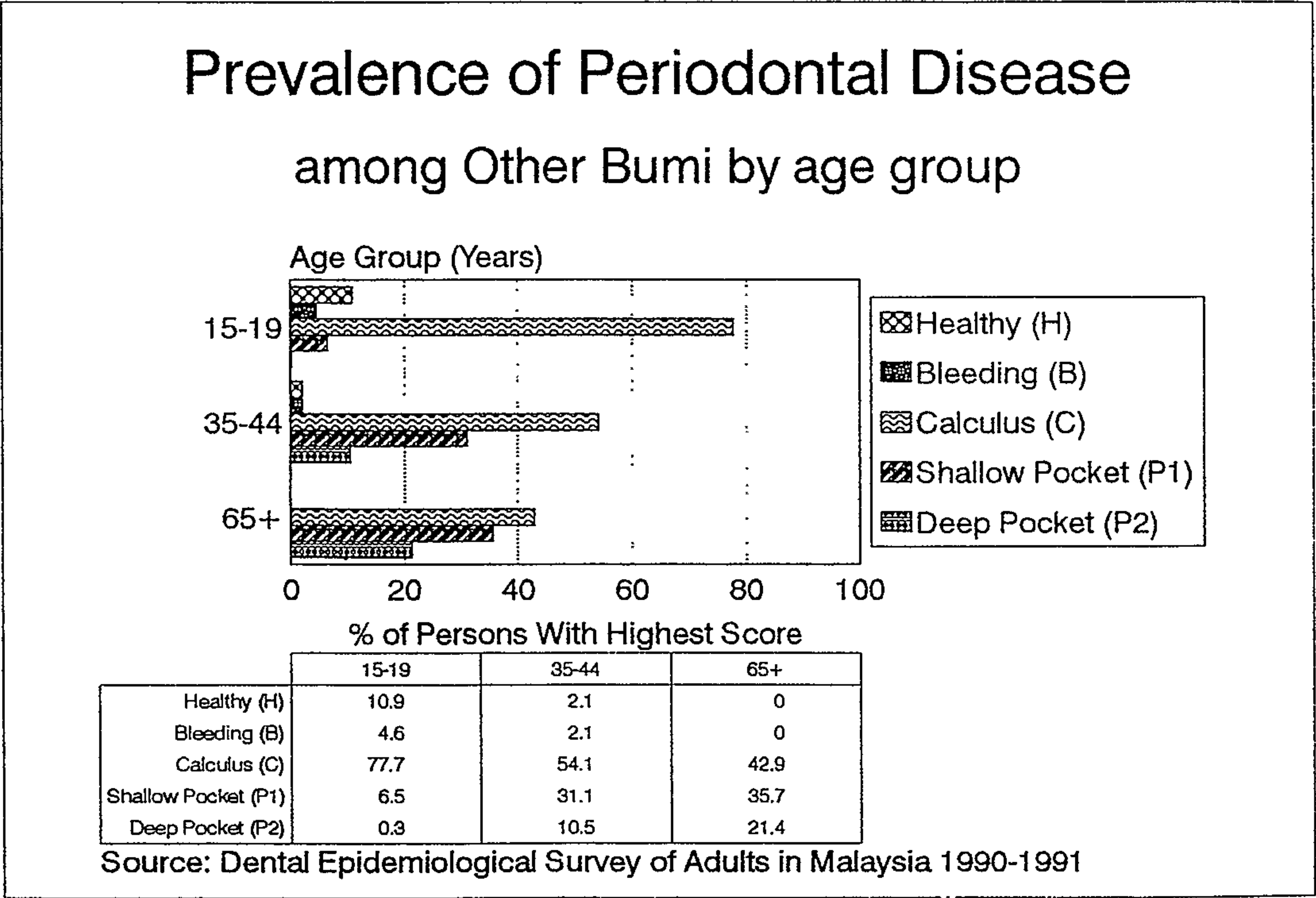
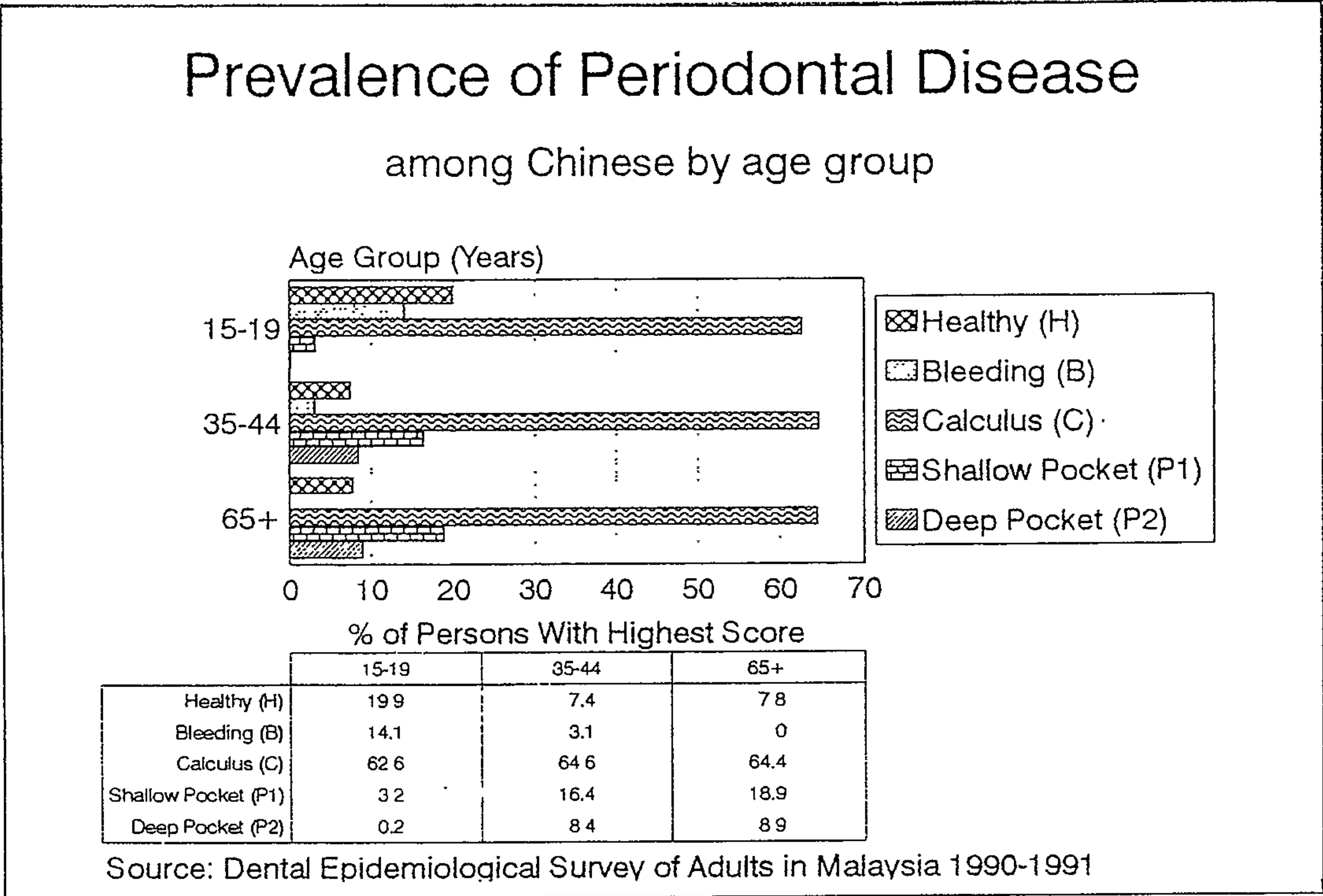


Figure 13



to decrease with age from 70.7 per cent at age 15-19 to 54.6 per cent in those aged 65 years and over. This is due to a corresponding increase in the prevalence of pocketing from 3.6 per cent at age 15-19 to 31.9 per cent (MNS 0.7) at 35-44 age group and 41.6 per cent (MNS 0.8) in the old age cohort 65 years and over.

The Other Bumis showed a similar pattern of disease prevalence as the Malays with calculus as the most prevalent condition at all age groups, and pocketing seen in the adults aged 35 years and above. Figure 12 shows that the prevalence of calculus seemed to decrease with age. This is due to a corresponding increase in the prevalence of shallow and deep pocket. The

prevalence of pocketing increased from 6.8 per cent at age group 15-19 to 41.6 per cent (MNS 0.9) at 35-44 years and 57.1 per cent (MNS 1.3) in the old age group of 65 years and over.

Figure 13 shows the prevalence of periodontal conditions among the Chinese. The figure shows that calculus was also the most prevalent condition among the Chinese population, and it did not show a decrease with age as seen in the Malays and the Other Bumis. The prevalence of pocketing increased with age from 3.4 per cent among the 15-19 year-olds to 24.8 per cent (MNS 0.5) in the adults aged 35-44 years, and 27.8 per cent (MNS 0.5) in the old age cohort aged 65 years and over. The prevalence of pocketing in the Chinese was the lowest among all the ethnic groups (Figure 14).

Figure 14

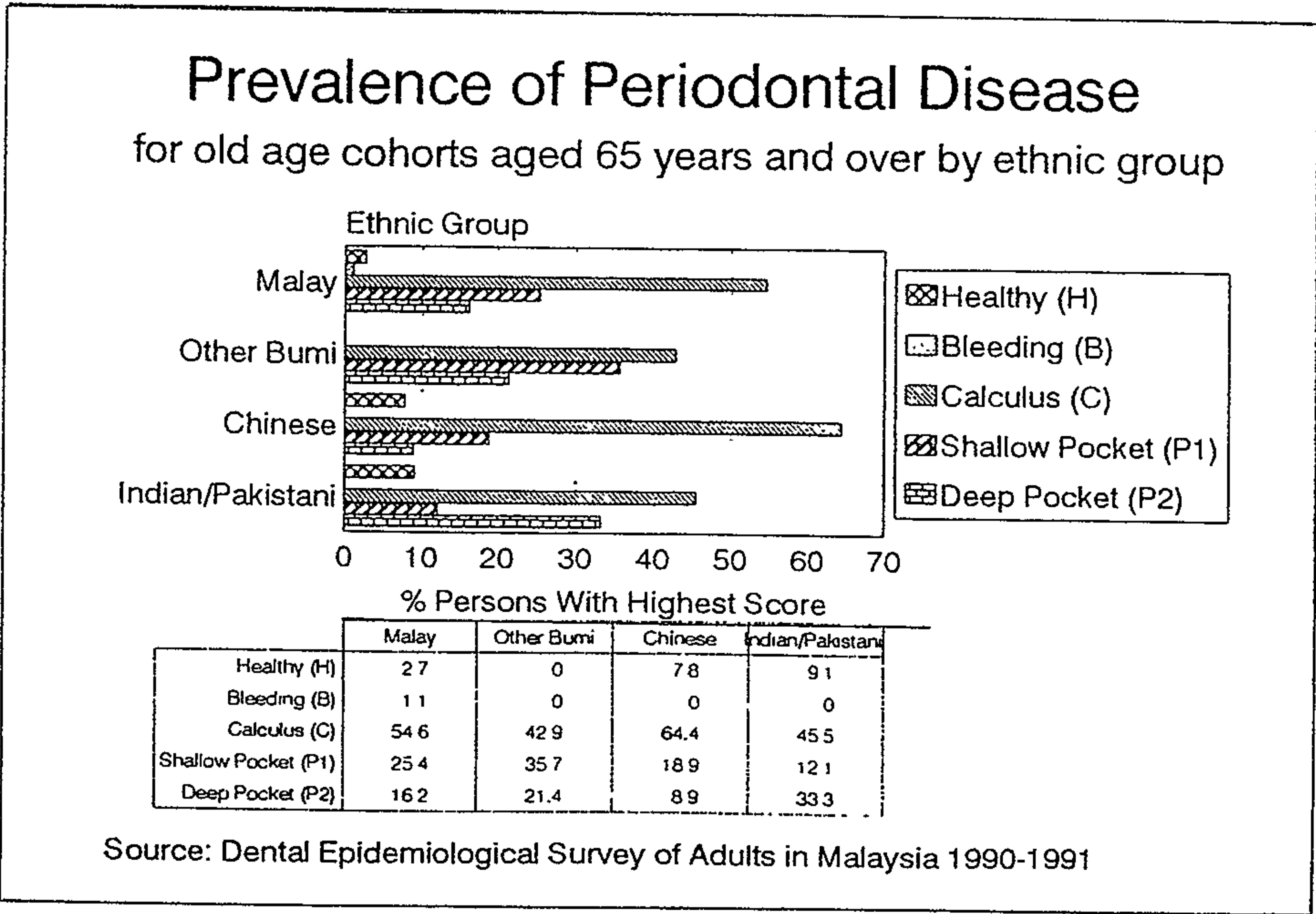
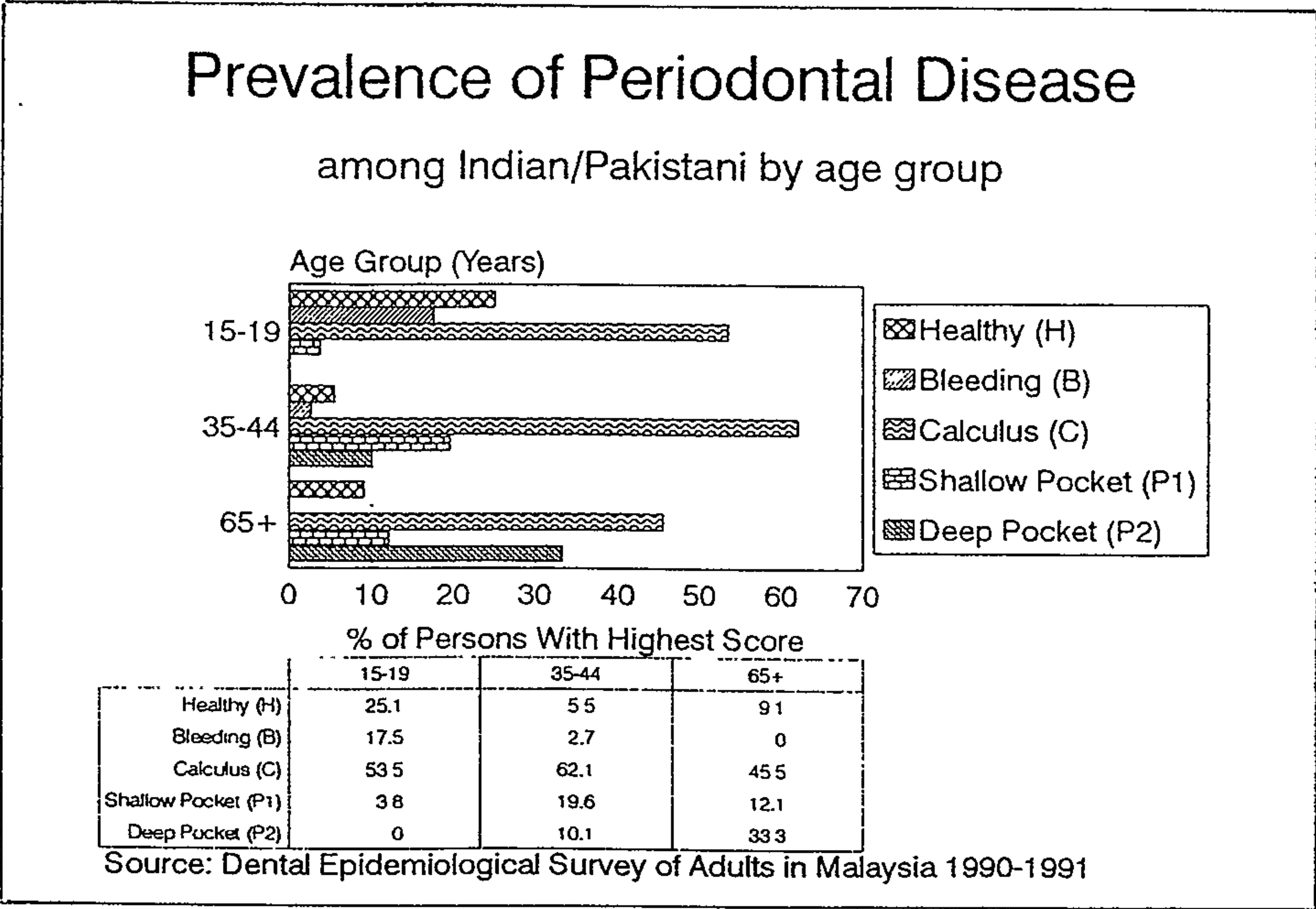


Figure 15 shows the periodontal conditions in the Indian/Pakistanis. It is shown that calculus was the most prevalent condition, and its prevalence peaked at the age group 35-44 years. It is observed that the percentage of the adolescents with healthy periodontium in this ethnic group was the highest among all ethnic groups (25.1 %) when we compare the data in this figure with those shown in Figures 11, 12, and 13. The prevalence of pocketing increased drastically from 29.7 per cent (MNS 0.6) at 35-44 age group to 45.4 per cent (MNS 1.4) in the old aged group of 65 years and above. It is interesting to note that while the Indian/Pakistanis showed the highest percentage of the population aged 65 years and over with healthy periodontium (9.1 %), they also showed the highest prevalence of deep pocketing (33.3 %) compared with the other ethnic groups in the same age group (Figure 14).

Figure 15



4.2.1.3 Prevalence of Periodontal Disease by Urban/Rural Area

Figure 16 shows the trend of prevalence of shallow pocketing with increasing age for urban and rural areas. The urban and rural populations showed similar prevalence of shallow pockets at younger age groups up to the age of 29 years, after which the rural population showed a higher prevalence than their urban counter-parts.

Figure 16

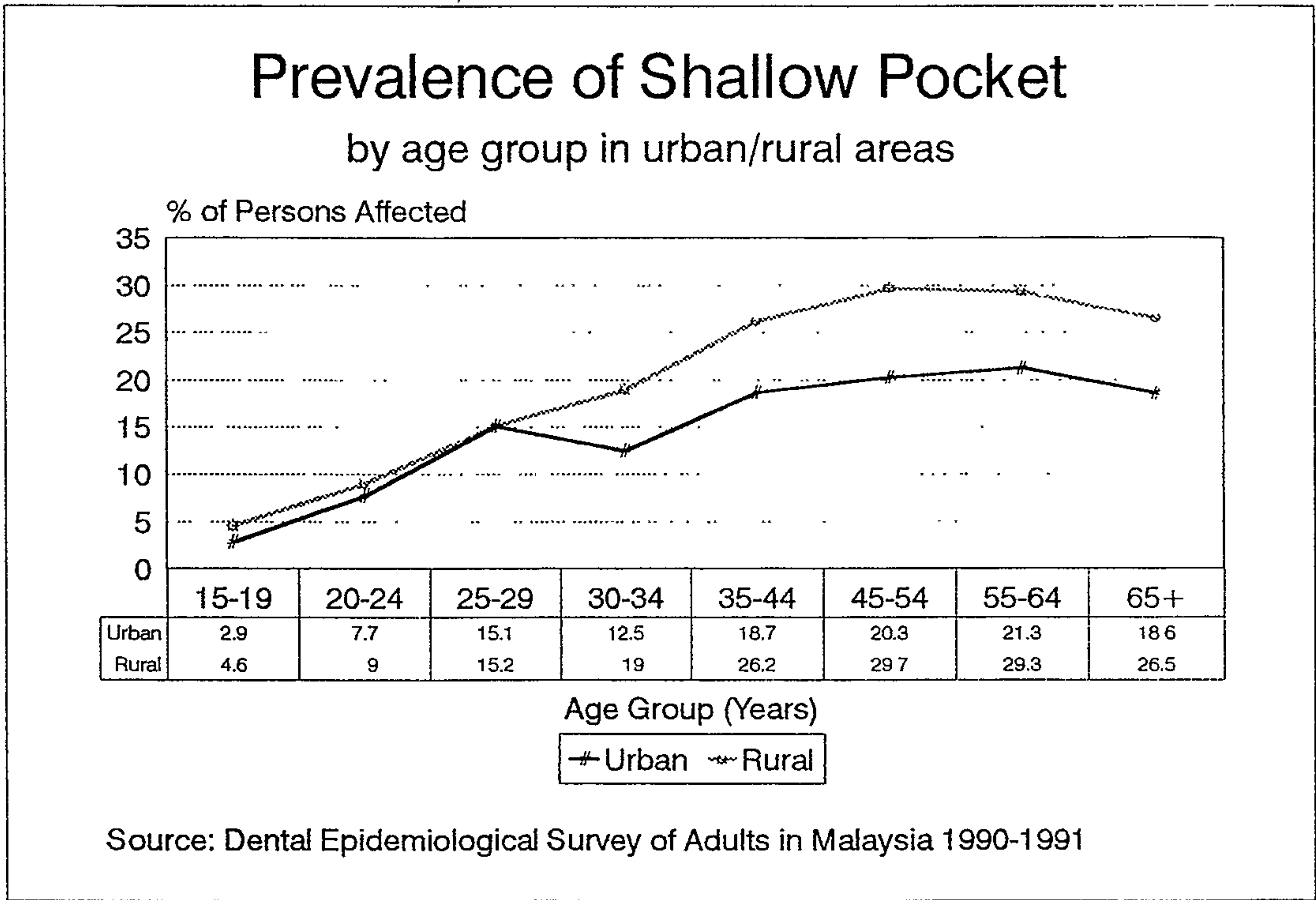


Figure 17

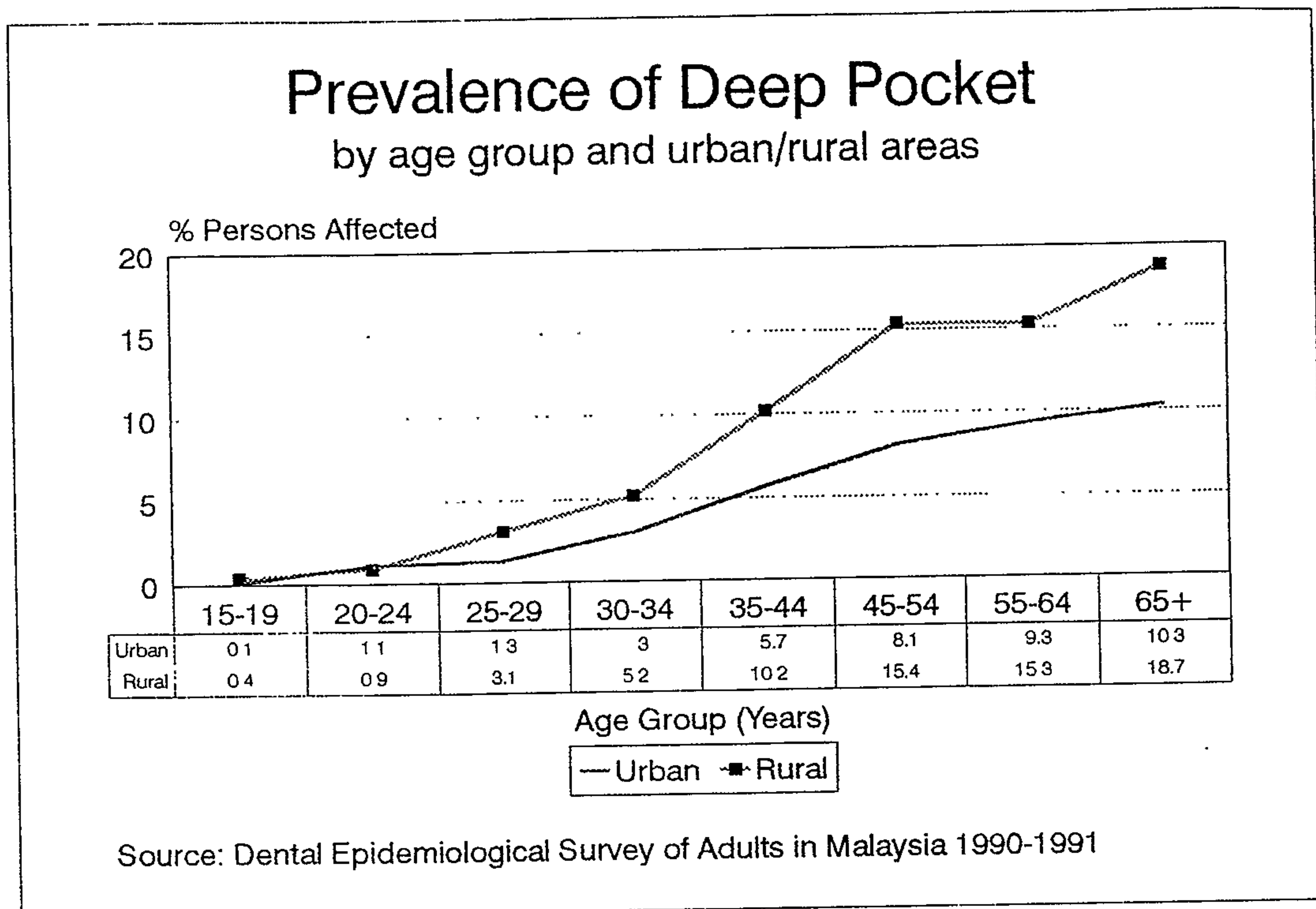


Figure 17 show the trend of prevalence of deep pockets with age. It is seen that at an early age up to 24 years there was no noticeable difference in the prevalence between the urban and the rural populations. From the age of 25 years and above, the rural population showed a markedly higher prevalence than those in the urban areas.

At 15-19 years of age the urban population showed a higher percentage (20.2 %) with healthy periodontium than those in the rural areas (14.7 %). The rural adolescents showed a higher prevalence (73.3 %) of calculus than those in the urban areas (61.2 %) as shown in Figure 18.

Figure 19 shows the prevalence of periodontal conditions in the 35-44 age groups in the urban and rural areas. It is shown that only 6.1 per cent of the urban population aged 35-44 years had healthy periodontium, and only 3.7 per cent of those in the rural areas had no periodontal conditions. Calculus was the most prevalent condition both in the urban as well as in the rural areas. Although the urban population seemed to have a higher prevalence (64.2 %) of calculus compared with their rural counter-parts (58.4 %), they showed a lesser prevalence of pocketing (24.4 %) compared with 36.4 per cent in the rural areas.

Figure 18

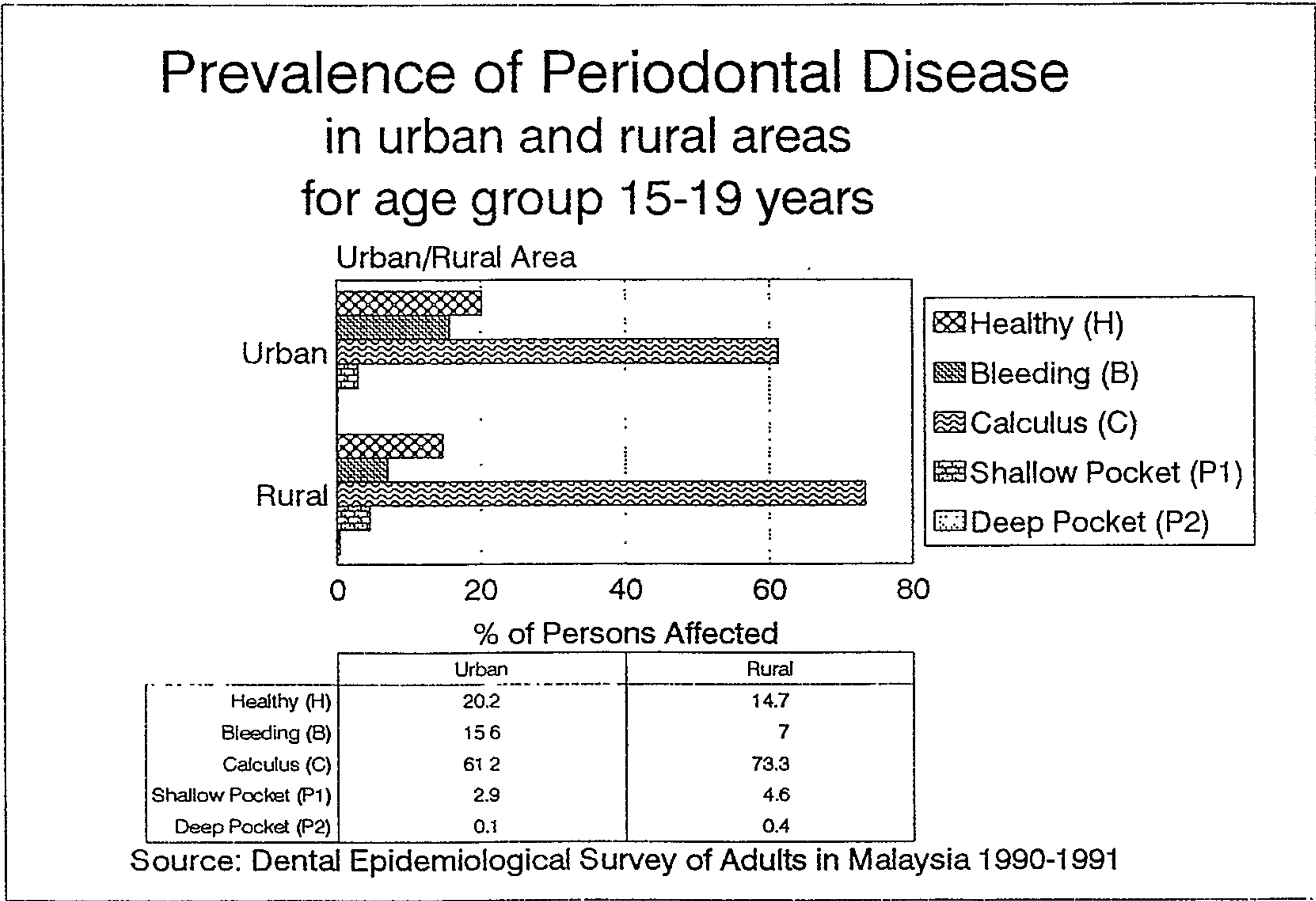


Figure 19

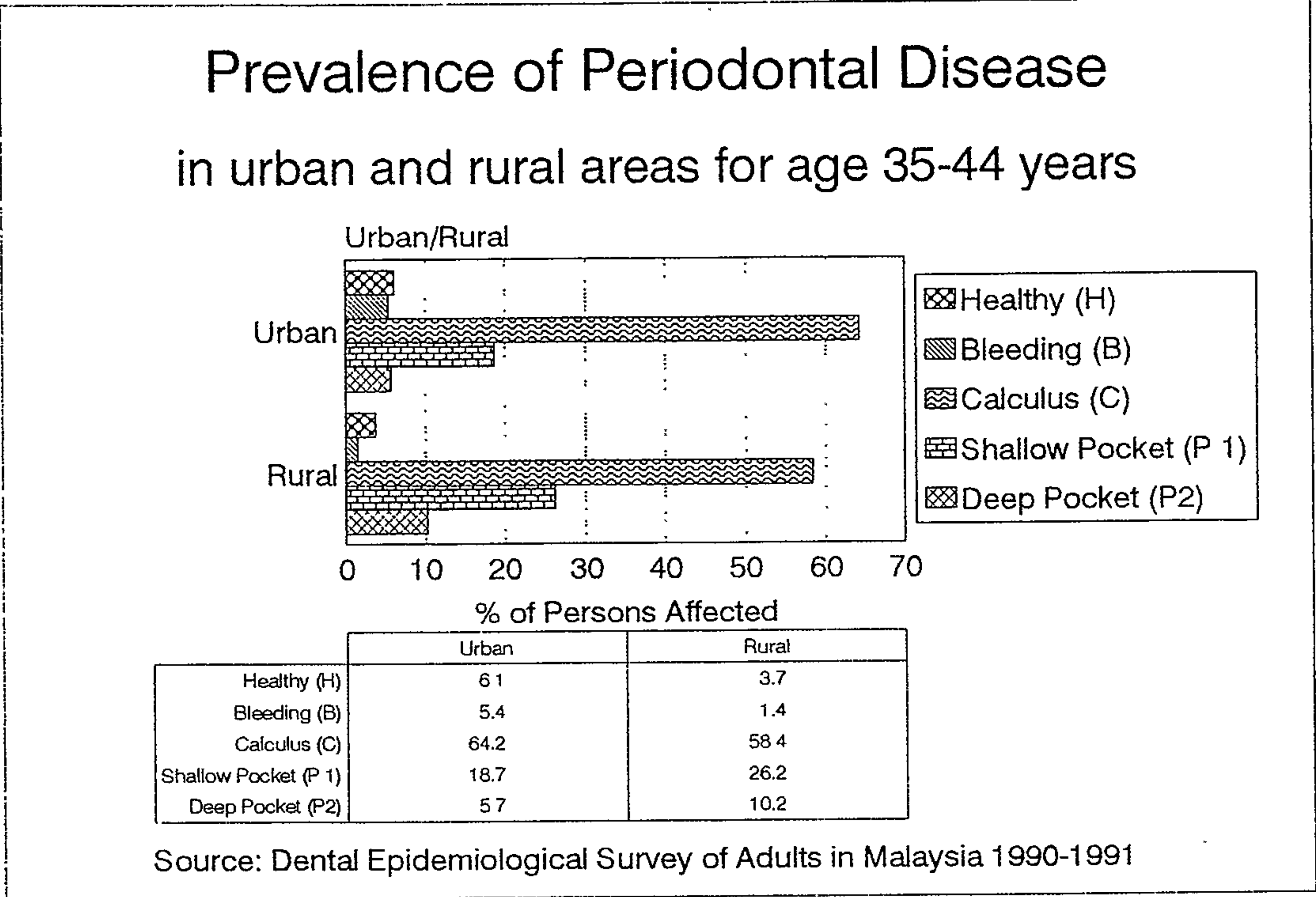
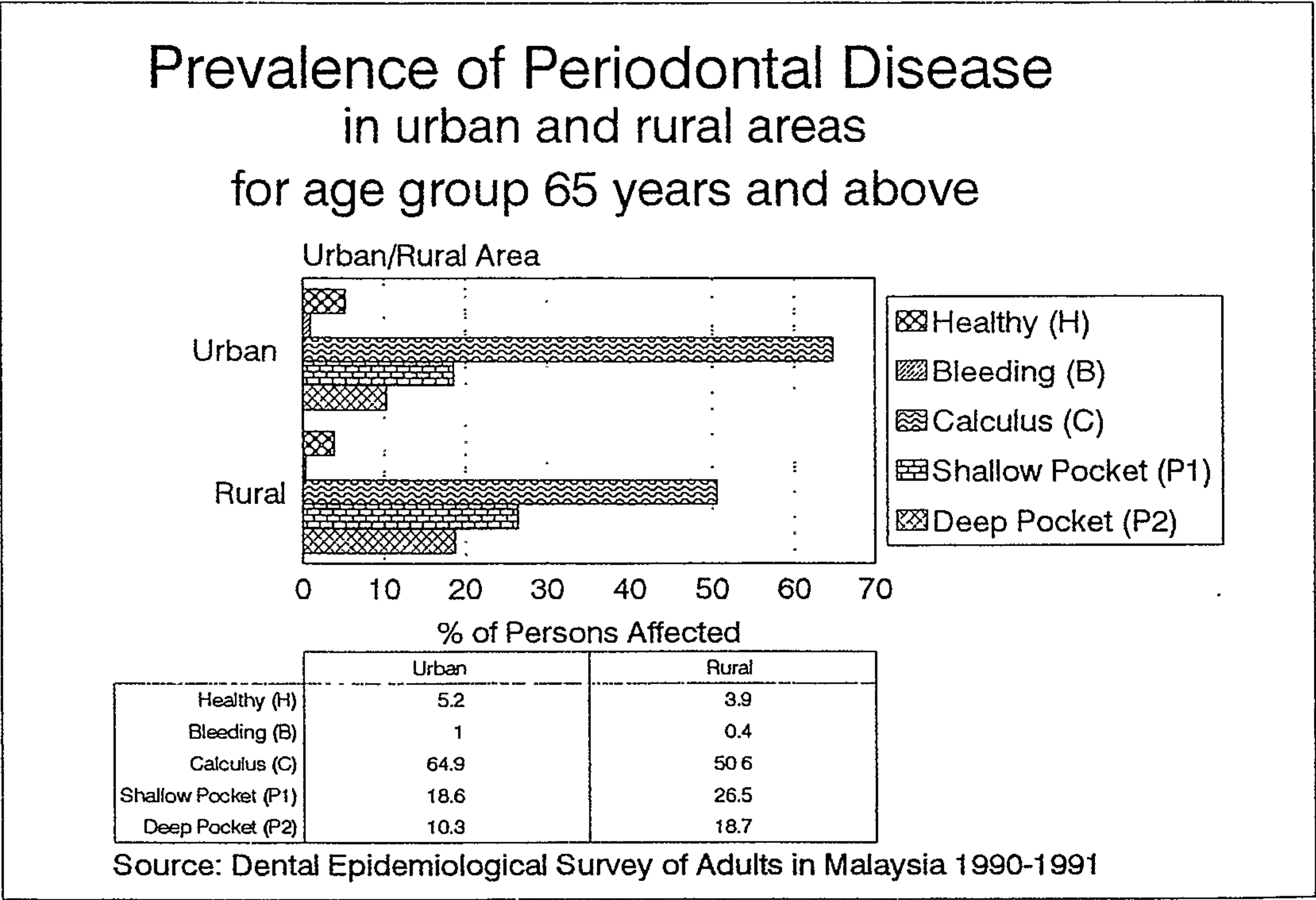


Figure 20



A similar pattern of difference between the urban and the rural populations existed in the old age cohort of 65 years and over. Although the urban population showed a higher prevalence of calculus (urban 64.9 %, rural 50.6 %), they had lower prevalence of shallow pocket (18.6 %) and deep pocket (10.3 %) compared with those in the rural areas who showed a prevalence of 26.5 per cent of shallow pocket and 18.7 per cent of deep pocket (**Figure 20**). The mean number of sextants with pocketing was 0.6 for urban population and 1.0 for those from the rural areas (**Figure 35 and 36** respectively).

4.2.1.4 Prevalence of Periodontal Disease by Gender

Figure 21 shows the prevalence of healthy periodontium in the males and females by age. It is shown that more females had no periodontal disease conditions compared to males up to the age of 64 years. The percentage of both males and females who did not have any periodontal conditions decreased with age.

Figure 22 shows the trend of prevalence of shallow pocket with increasing age among males and females aged 15 years and over. It is observed that from the age of 25 to 64 years males showed a higher prevalence of shallow pocket than females. After the age of 64 years females (25 %) showed a higher prevalence than males (23.8 %), probably due to a corresponding increase in the prevalence of deep pocket in males at that age (**Figure 23**).

Figure 21

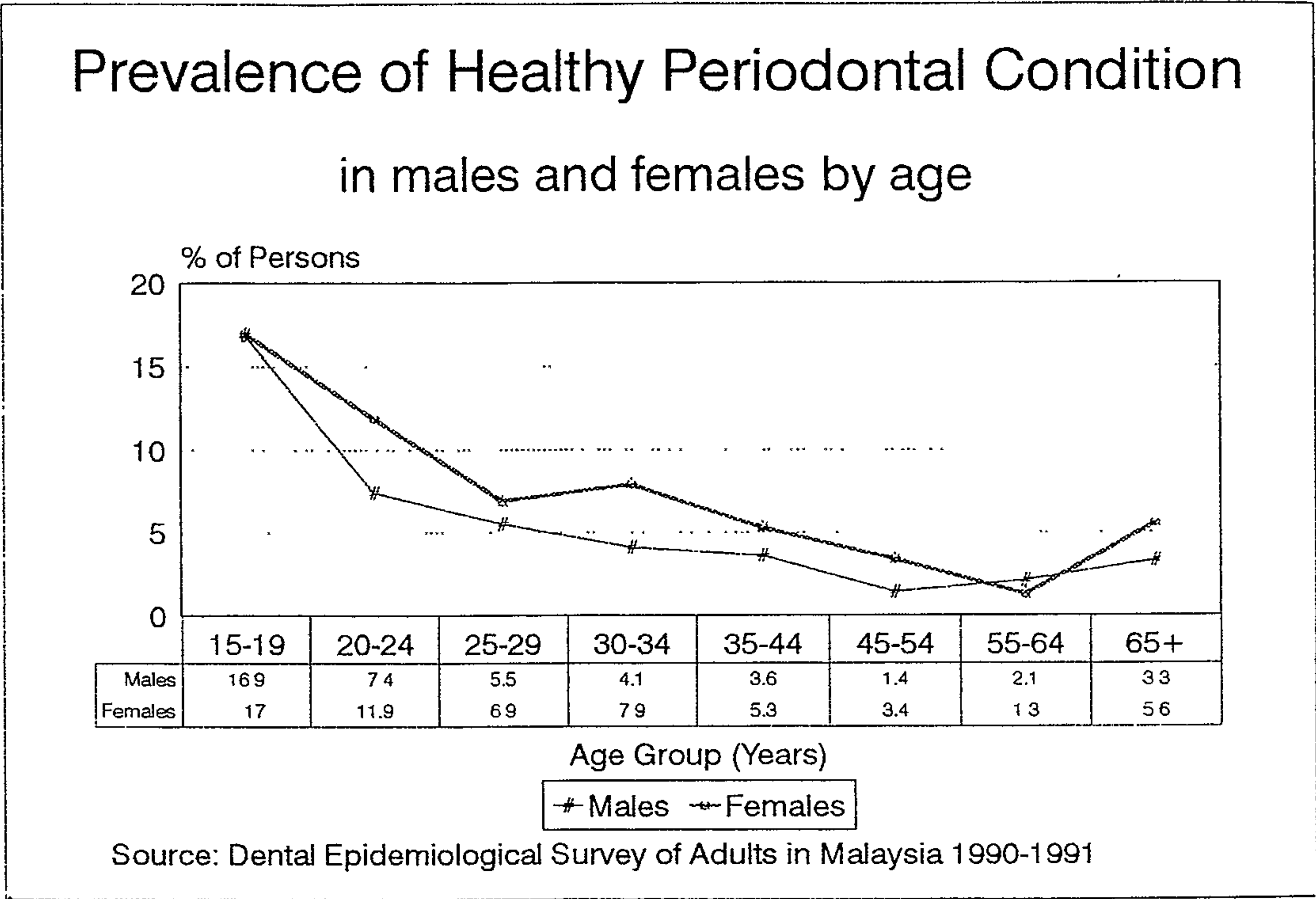
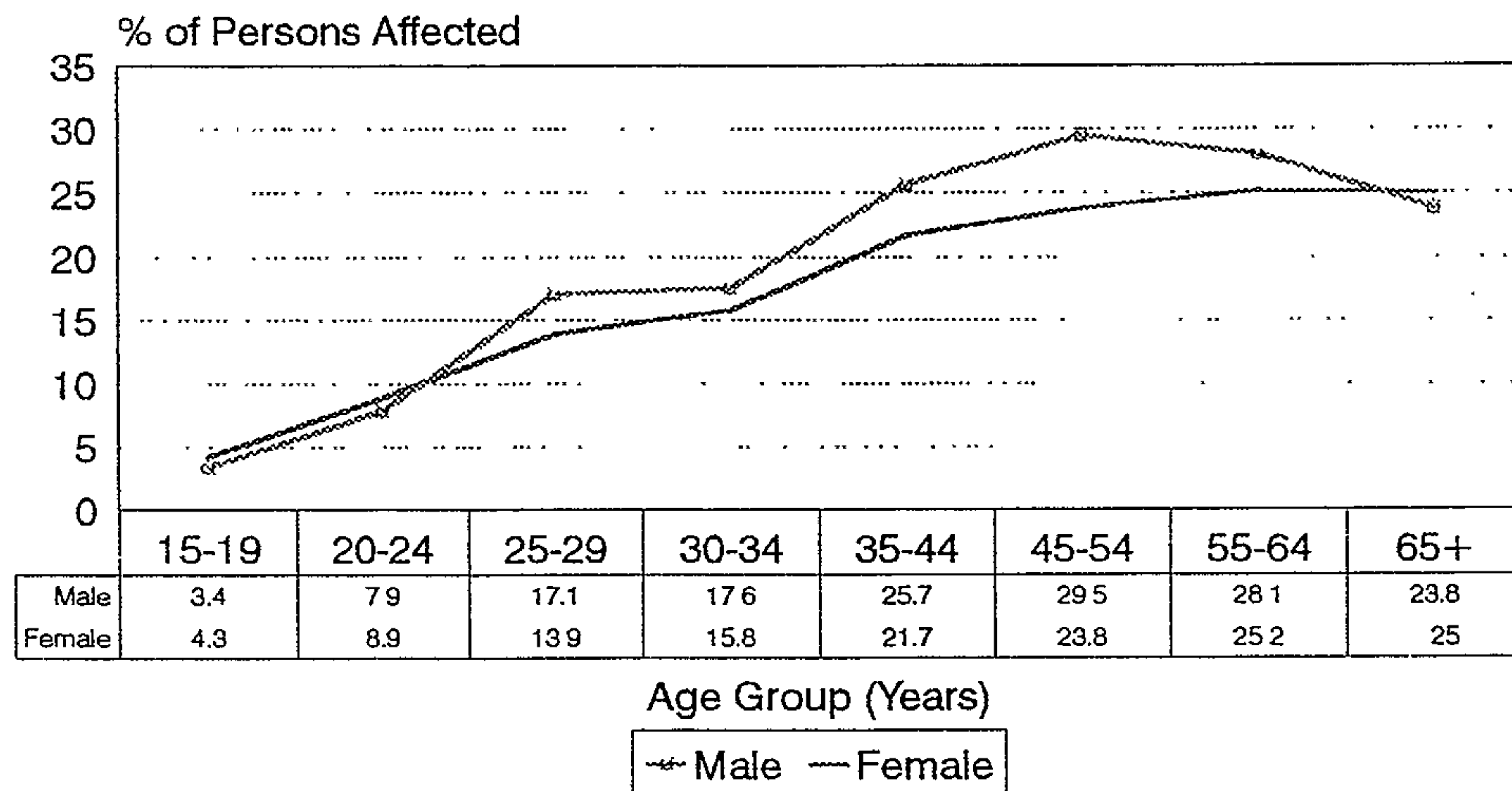


Figure 23 shows that from the age of 15 to the age 34 years males and females showed a similar prevalence of deep pocket. But males showed higher prevalence than females after the age of 35 years. Males seemed to show a drop in the prevalence of deep pocket between the age groups of 45-54 and 55-64 years from 15.6 per cent at 45-54 years and 13.5 per cent for those aged 55-64 years. This could be due to the loss of teeth as shown by a noticeable decrease in the mean number of teeth present from 20.5 to 14 over the same age range (Figure 34), and an increase in the mean number of edentulous sextants (Figure 33), assuming that males accounted for the main cause of those changes.

Figure 22

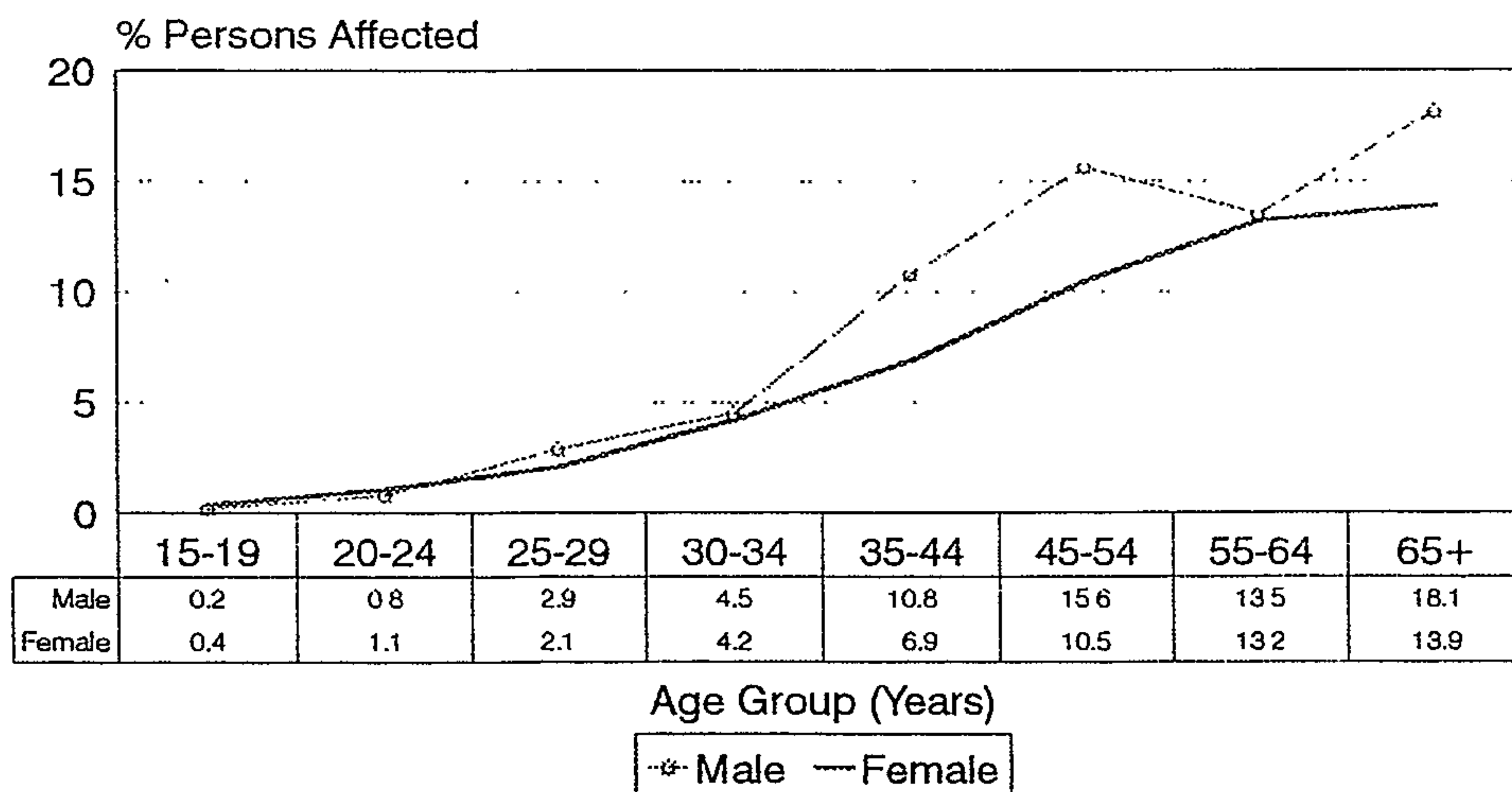
Prevalence of Shallow Pocket by age group and sex



Source: Dental Epidemiological Survey of Adults in Malaysia 1990-1991

Figure 23

Prevalence of Deep Pocket by age group and sex



Source: Dental Epidemiological Survey of Adults in Malaysia 1990-1991

4.2.2 Severity of Periodontal Disease

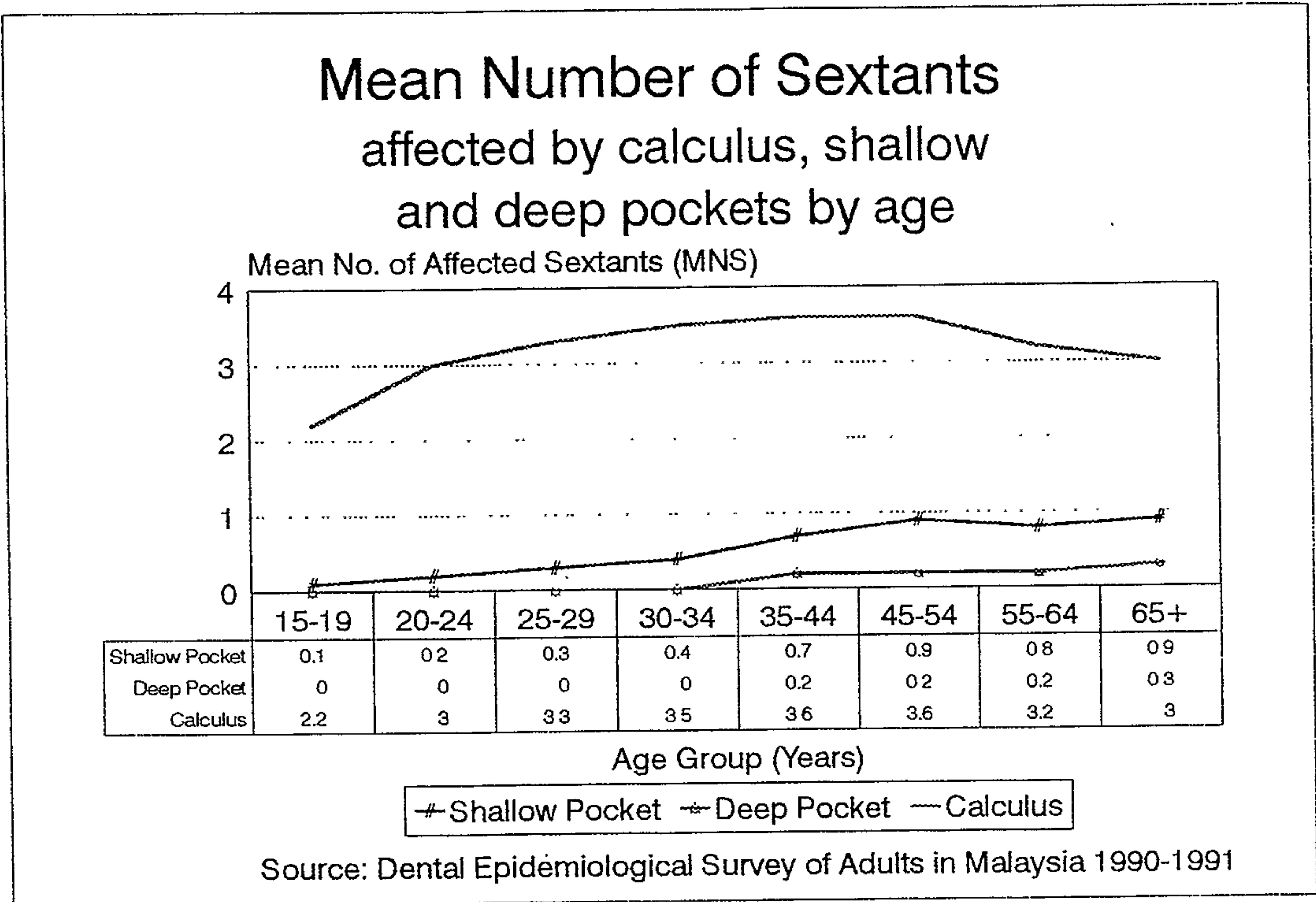
The increase in the severity of periodontal disease can be gleaned from a number of factors, namely:

- i. the mean number of affected sextants (MNS);
- ii. the mean number of edentulous sextants (MNES);
- iii. the mean number of teeth (MNT) present;
- iv. the level of edentulousness;
- v. a correspondingly higher increase in the prevalence of a higher score compared with a lower score within the same age group or age range.

4.2.2.1 Based on Mean Number of Affected Sextants

Figure 24 shows the mean number sextants affected by calculus, shallow pocket and deep pocket with age. It is shown that the mean number of sextants with calculus as the highest score peaked at the age of 35-54 years at MNS 3.6. The severity of shallow pockets seemed to increase with age up to the age of 54 years from MNS 0.1 at 15-19 age group to 0.9 at 45-54 age group, after which it seemed to level off. Deep periodontal pocket did not seem to be a serious problem, affecting only a mean of 0.2 sextant from the age of 35 to 64 years, and only in a mean of 0.3 sextant in those aged 65 years and over. But the seriousness of the problem could be masked by increased tooth loss at this old age group.

Figure 24



**4.2.2.2 Based on Mean Number of Edentulous Sextant and Mean
Number of Teeth Present**

Figure 25 shows the mean number of edentulous sextants (MNES) with age in dentate subjects. It is shown that the MNES increased with age from 0.1 at age group 20-24 to 2.6 in those aged 65 years and over. Although the reason for tooth loss could be due to other factors, it could not be denied that periodontal diseases were partly responsible, more so at older age groups.

The gradual reduction in the mean number of teeth present (MNT) in dentate subjects as shown in **Figure 26** could also be due to periodontal reasons implying that periodontal diseases increased in severity with increasing age. It is interesting to note that the MNT had shown an increase over all age groups compared with that seen in 1974. At age group 65 and above the MNT had increased from 7.5 in 1974 to 11.6 in 1990. This implies an overall improvement of oral health of adults in Malaysia since 1974.

Figure 25

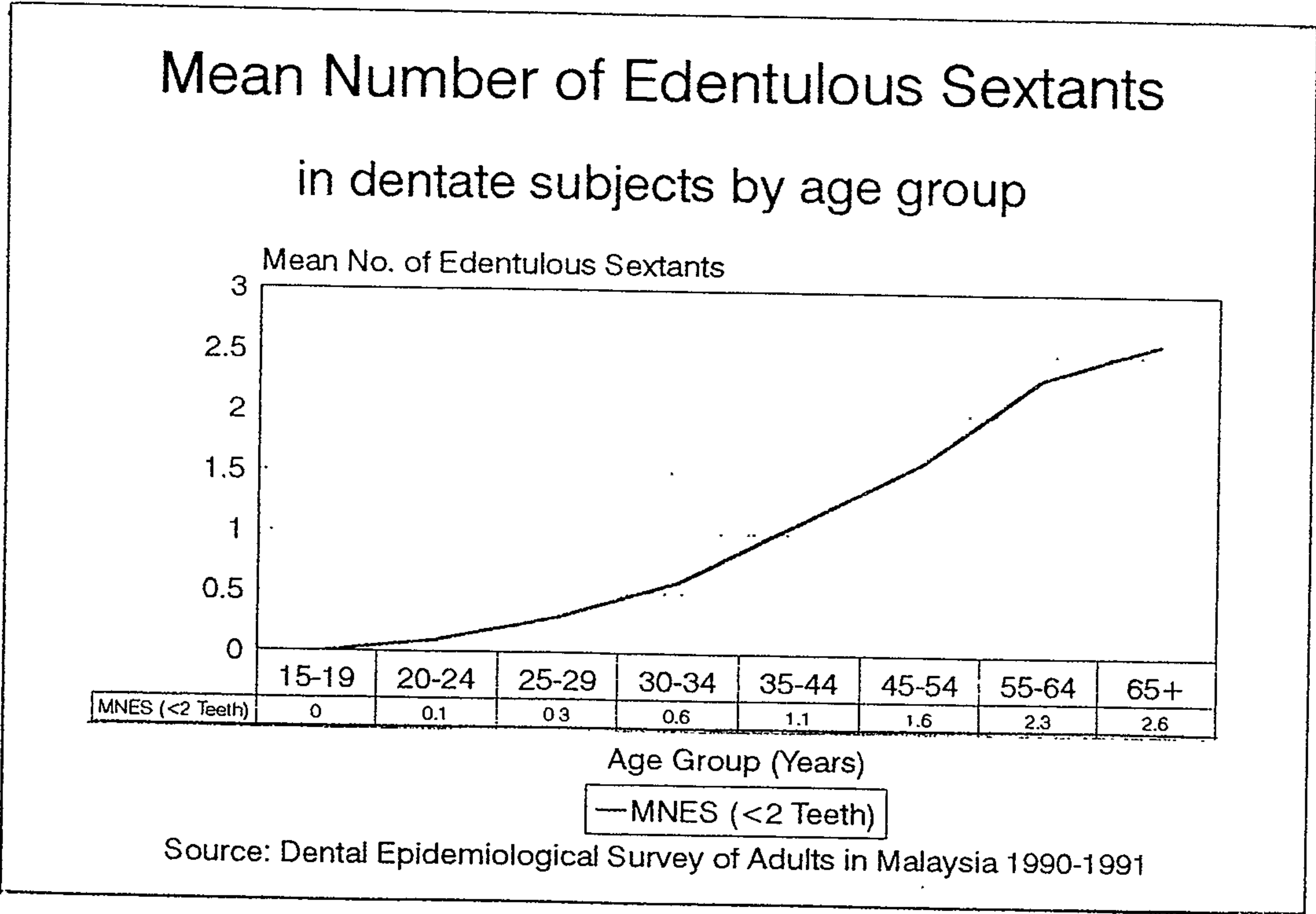
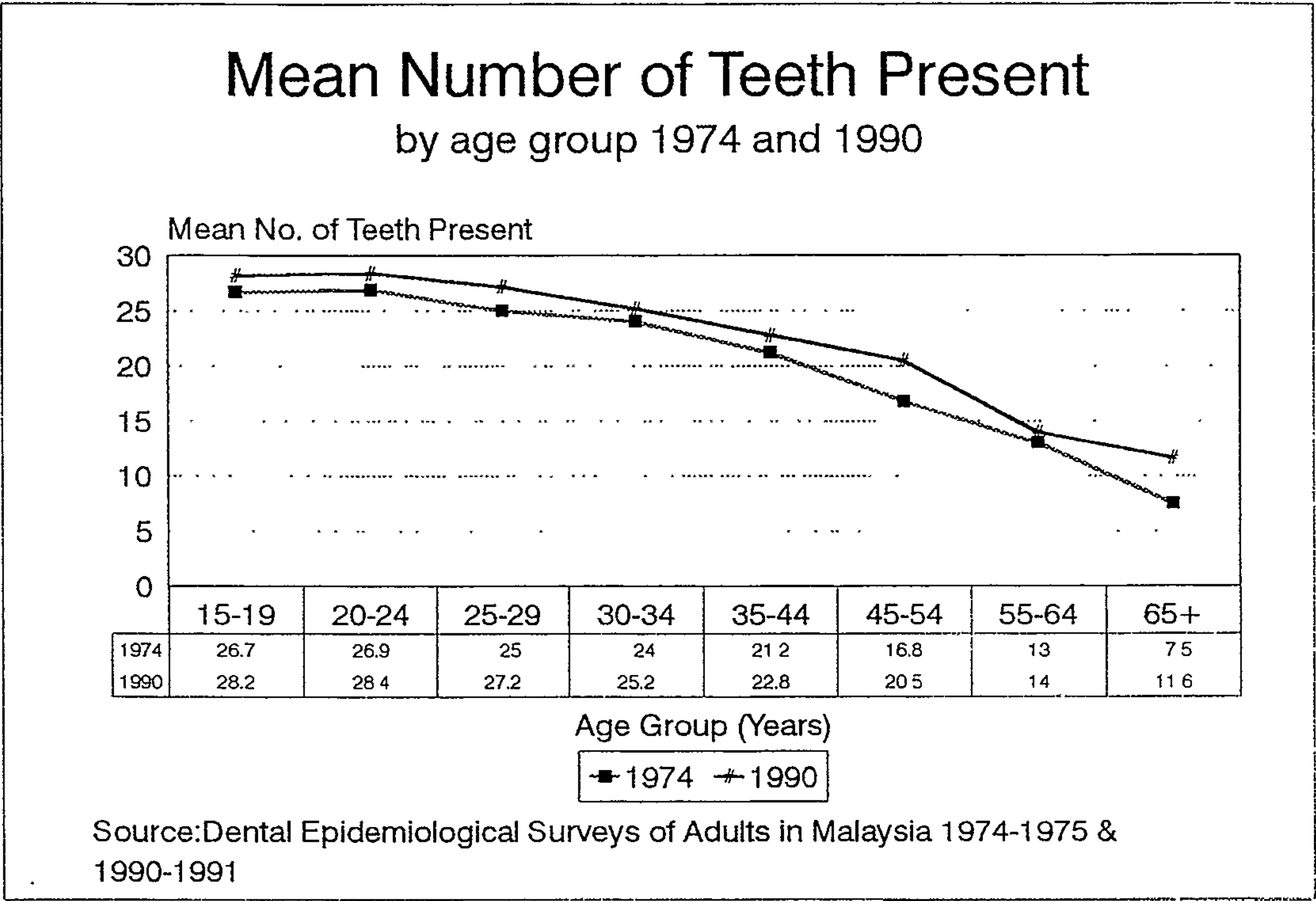


Figure 26



4.2.2.3 Based on The Level of Edentulousness

Figure 27 shows the level of edentulousness with age. The figure shows that the prevalence of edentulousness increased with age, and that there was a marked increase from 2.2 per cent at the age of 30 years to 56.6 per cent among those aged 65 years and over. It is reasonable to assume that this marked increase was partly due to periodontal reasons, implying again an increased severity of periodontal disease with increasing age.

4.2.2.4 **Difference in Severity Between Urban and Rural Areas**

Figure 28 shows the mean number of sextant affected by shallow and deep pocketing in the urban and rural areas. It is observed that pocketing was more severe in the rural population than in those from the urban areas over all age groups above the age of 20 years.

Figure 27

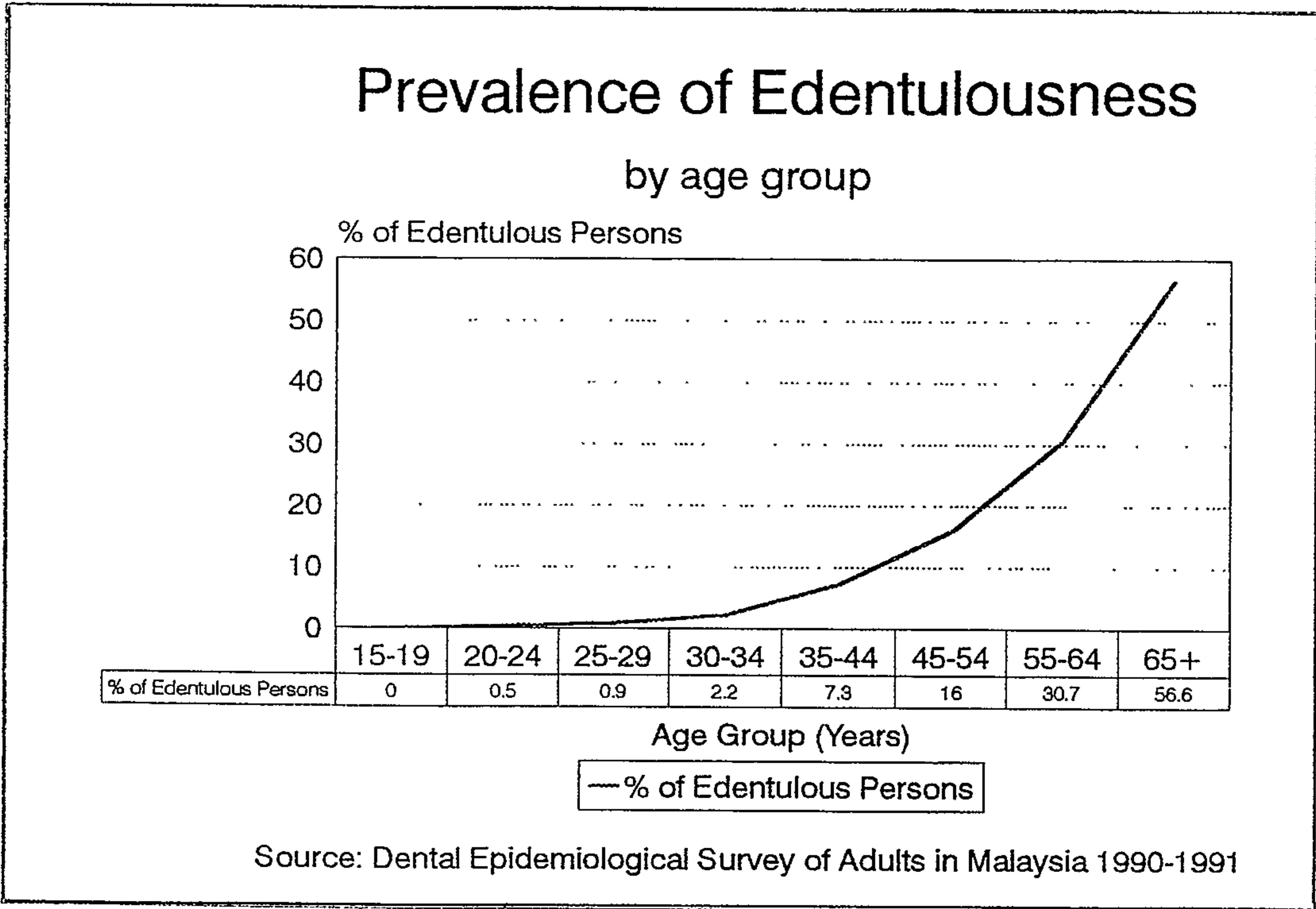


Figure 29 shows the difference between the mean number of sextants affected by deep pocketing in the urban and in the rural areas. It is observed that the rural population had more severe deep pocketing compared with their urban counter-parts after the age of 35 years.

Figure 28

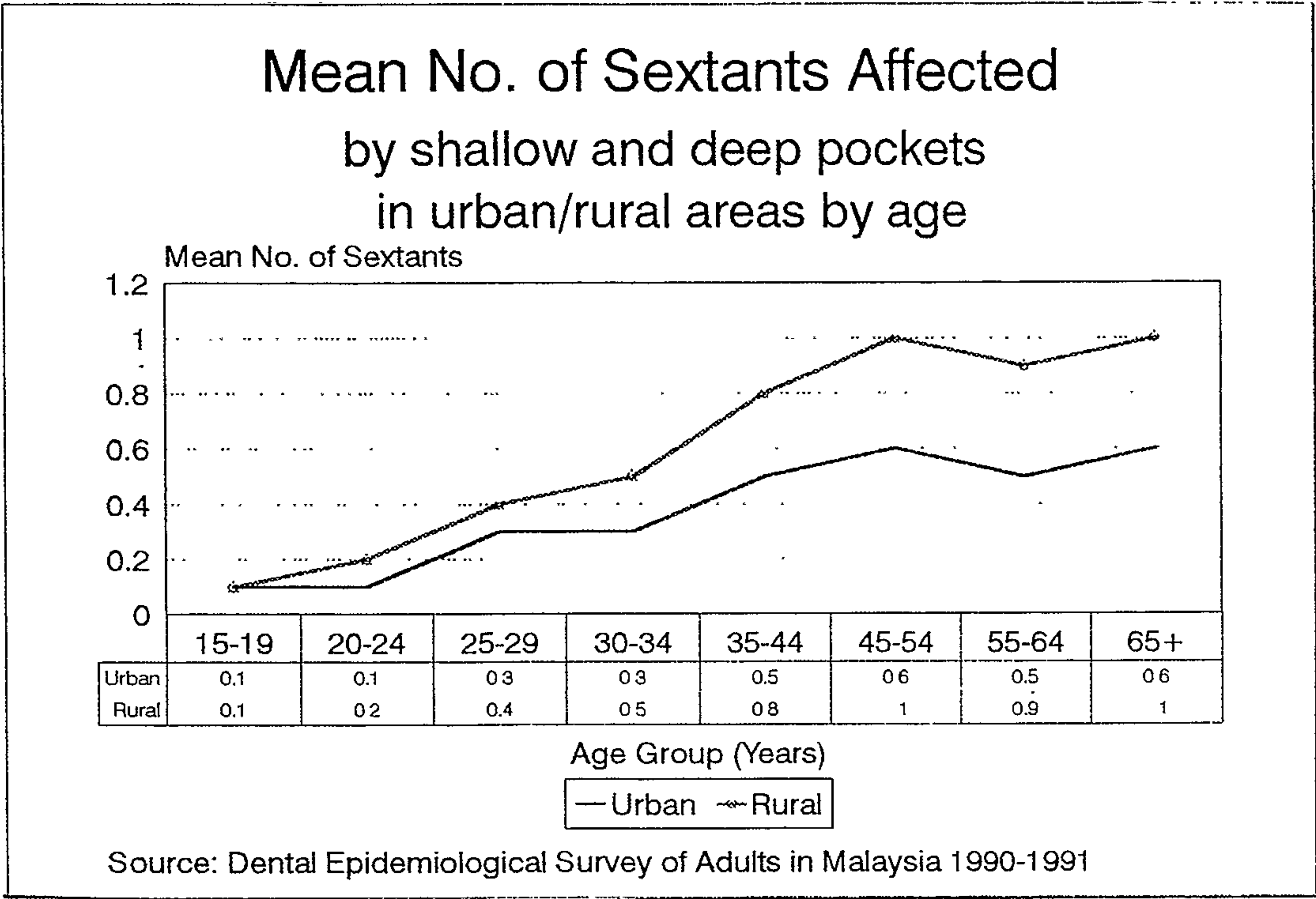
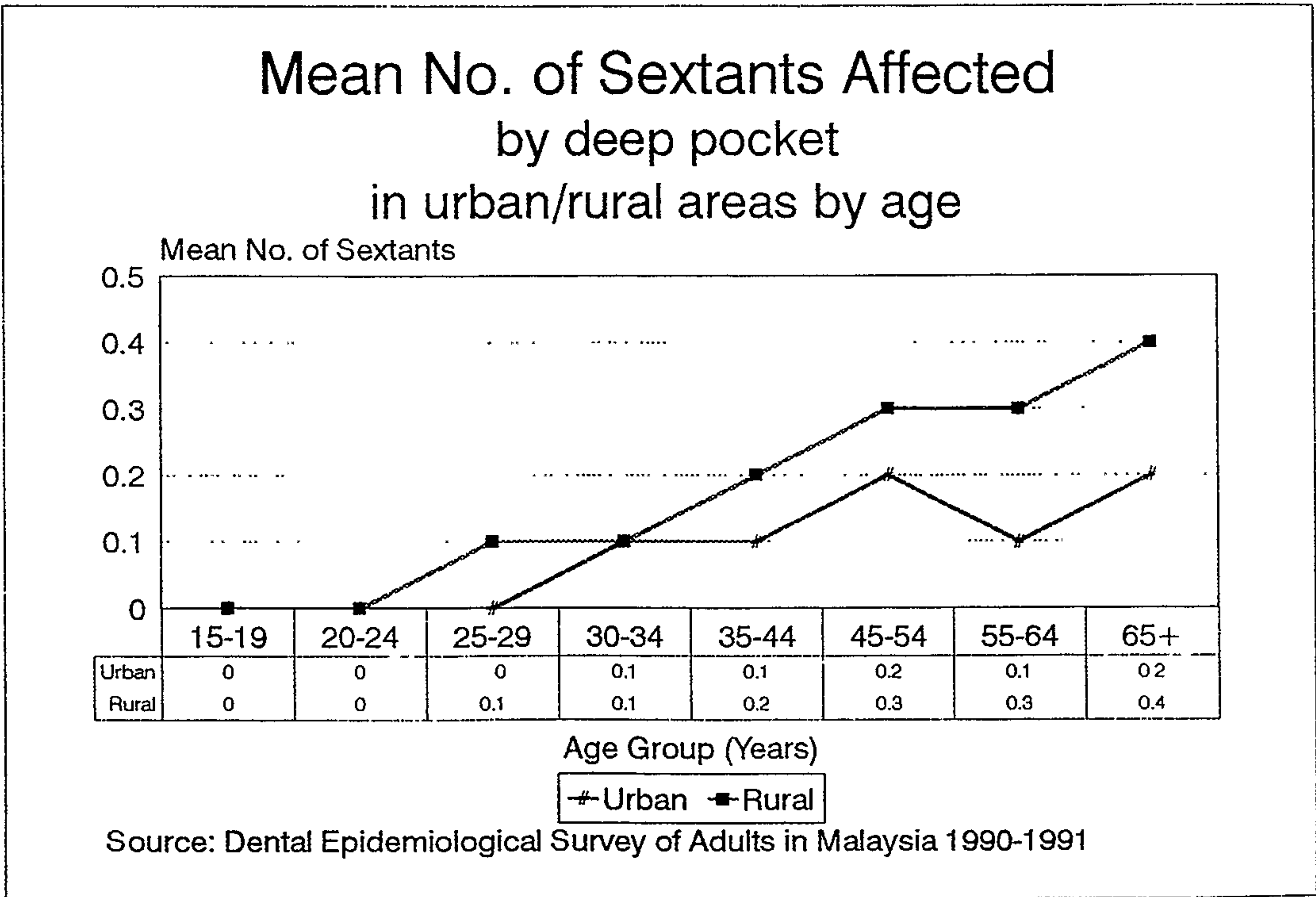


Figure 29



4.2.3 Periodontal Treatment Needs

In this section the treatment needs are discussed in three parts, namely:

- i. treatment needs based on age group;
- ii. treatment needs by ethnic group;
- iii. treatment needs by area (urban/rural) and gender.

4.2.3.1 Treatment Needs Based on Age Group

Figure 30 shows the treatment need for periodontal disease by age. It is shown that the commonest treatment needs for all age groups were TN 1 (oral hygiene instruction or OHI) and TN 2 (scaling and OHI). The percentage of persons requiring TN 1 increased from 83.1 per cent in the 15-19 age group to 95.4 per cent in the 35-44 age group, and 95.8 per cent in those 65 years and above. The percentage of persons requiring TN 2 increased from 72.7 per cent (MNS 2.2) among those aged 15-19 years to 92.5 per cent (MNS 3.6) of those in the 35-44 age group, and 95.2 per cent of the old age cohort aged 65 years and over (MNS 3). Complex periodontal treatment TN 3 was assessed to be required by 8.5 per cent of adults aged 35-44 years, involving a mean of 0.2 sextant, and for 16.4 per cent of those aged 65 years and above, involving a mean of 0.3 sextant.

Figure 31 shows the relation between the percentage of persons who did not require any periodontal treatment (TN 0) and the percentage of those who were assessed to require complex periodontal treatment (TN 3). It is observed that there was an inverse relationship between the two treatment

Figure 30

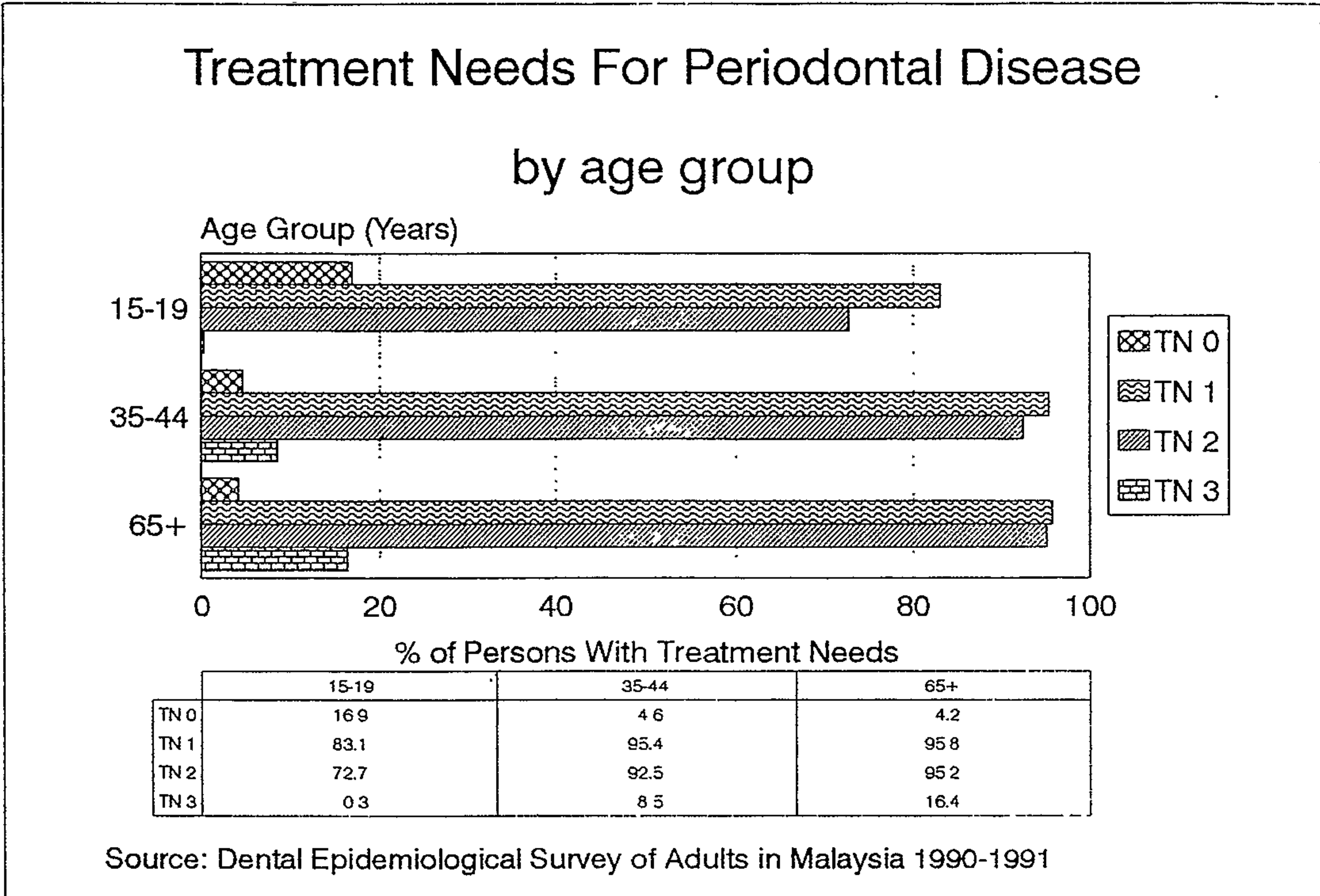
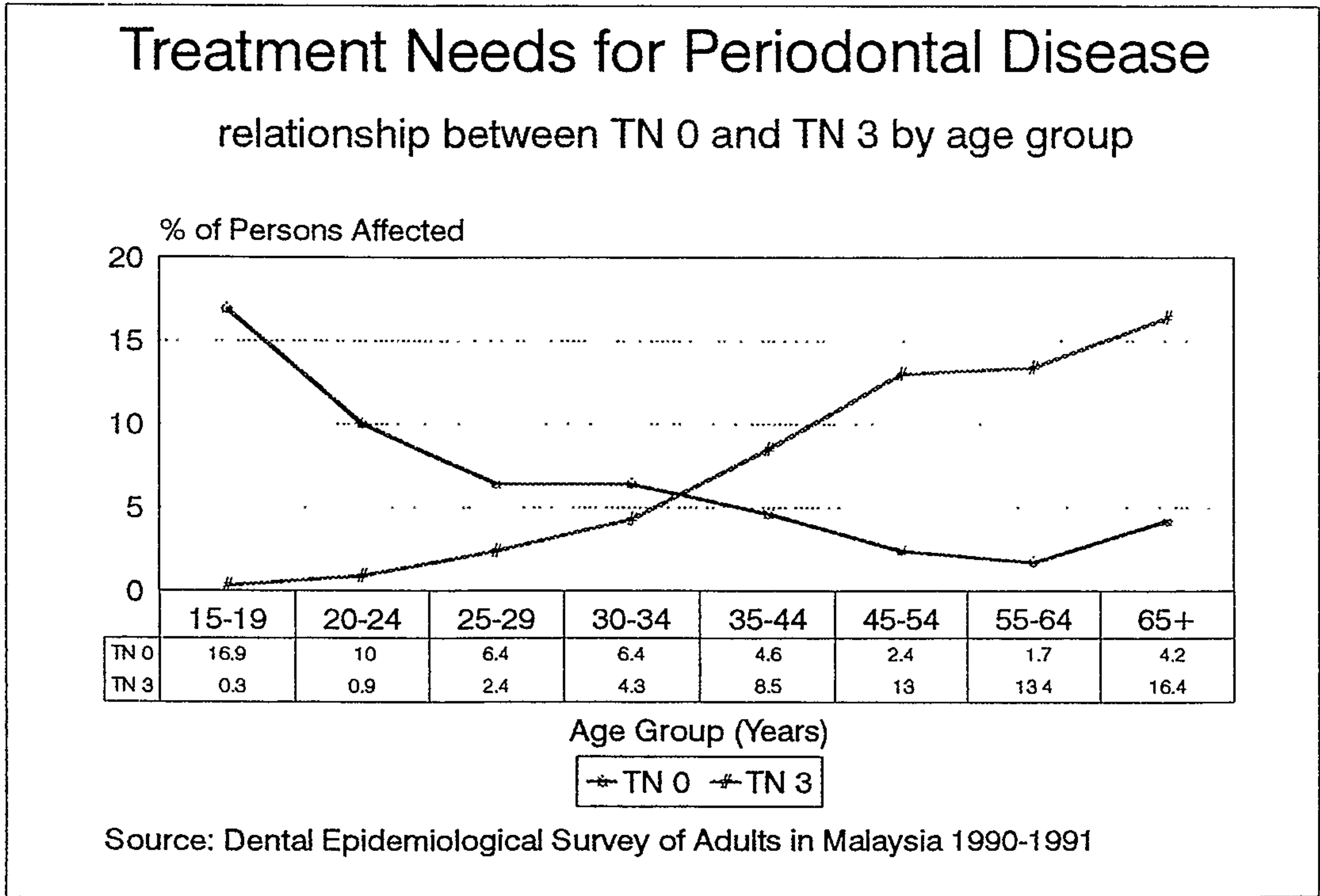


Figure 31



categories with an equilibrium at about the age of 34 years, where the percentage for TN 0 and TN 3 would be about 6 per cent each.

4.2.3.2 Treatment Needs by Ethnic Group

Figure 32 shows the periodontal treatment needs for those aged 15-19 years by ethnic groups. It is shown that TN 1 and TN 2 were the commonest treatment needs for this age group. The Other Bumi had higher treatment needs than the other ethnic groups. The Indian/Pakistanis showed the highest percentage of persons who did not require any treatment at this age group.

Figure 32

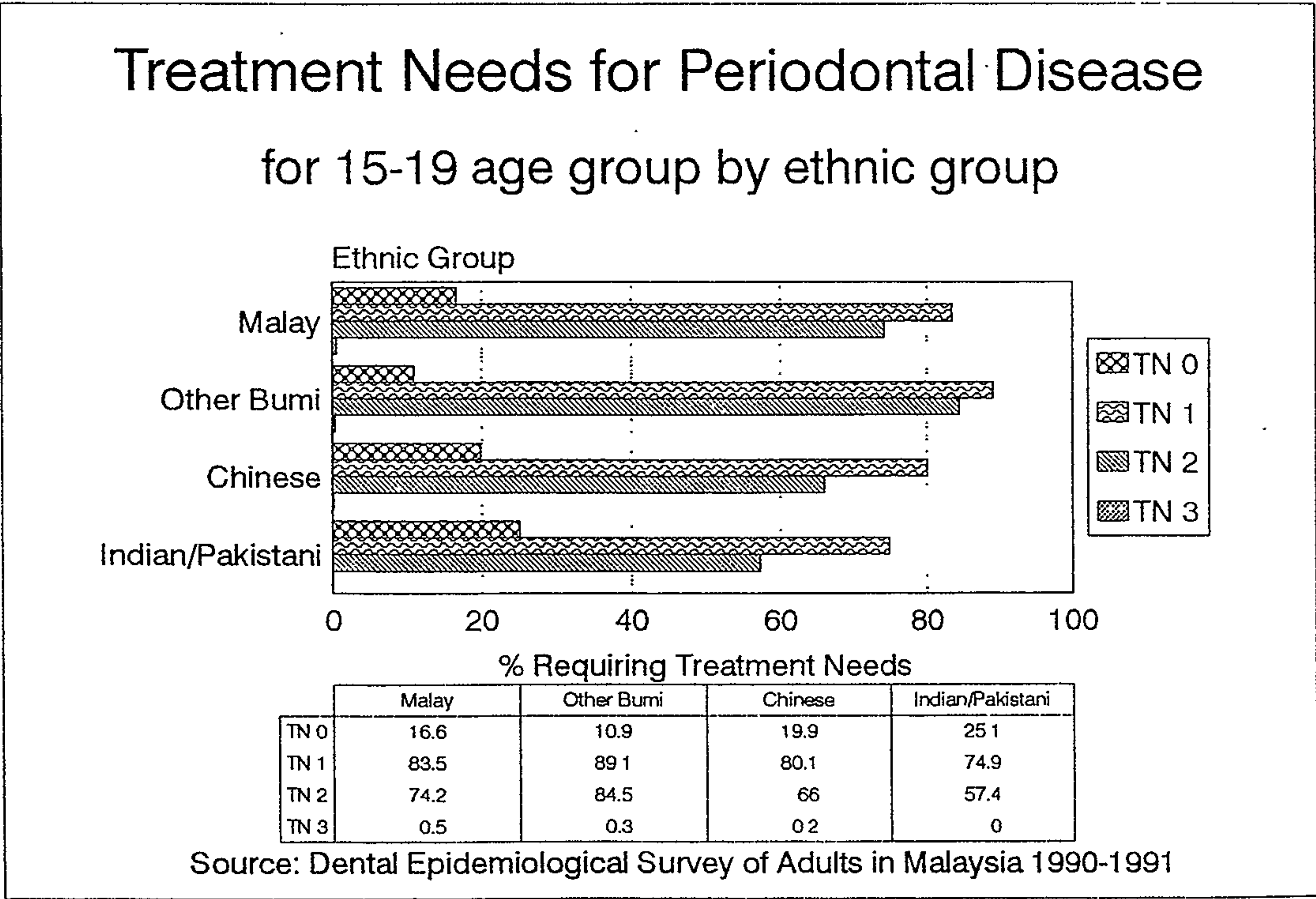


Figure 33

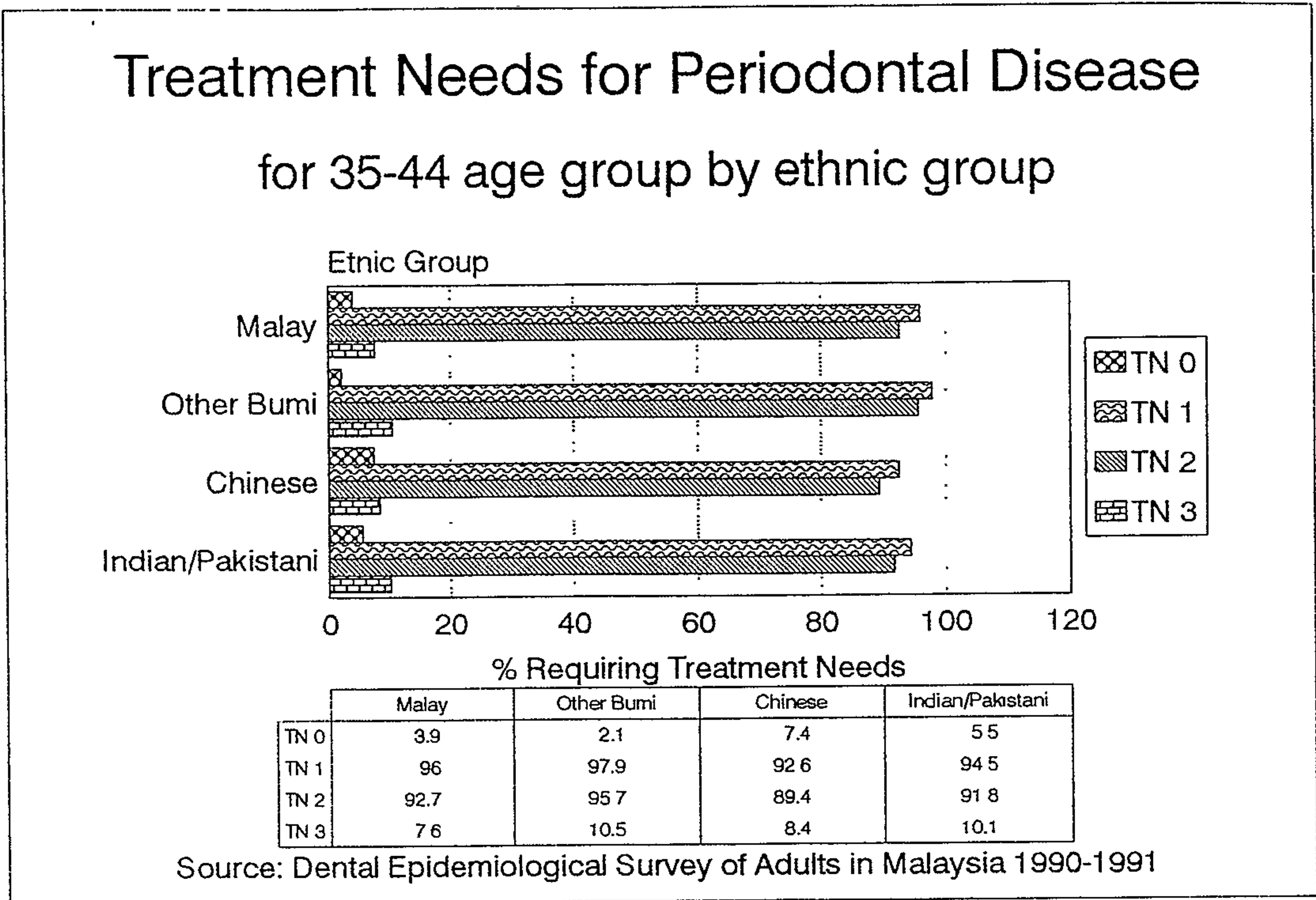
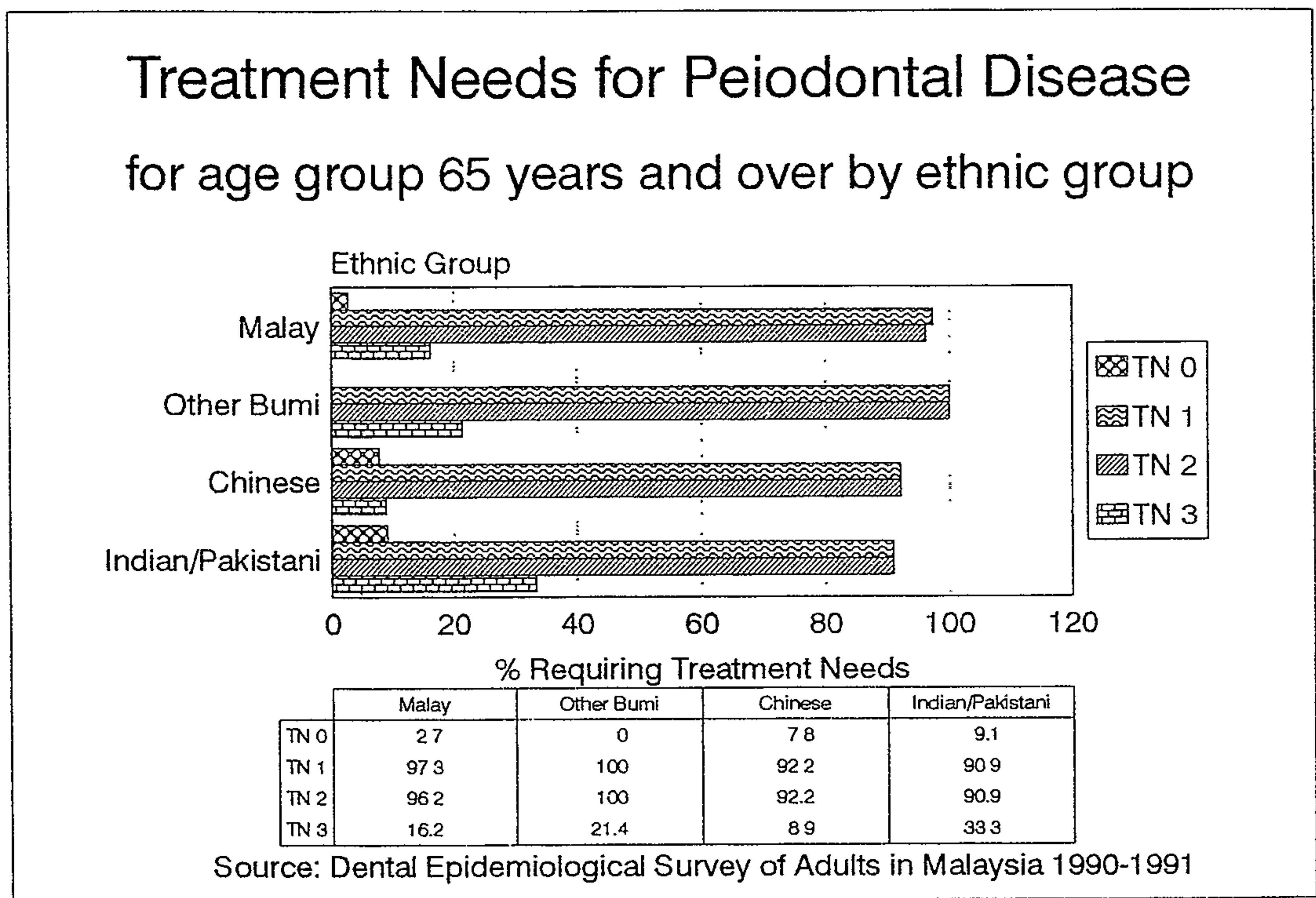


Figure 33 shows the treatment needs for adults aged 35-44 years by ethnic groups. It is shown that TN 1 and TN 2 were the commonest treatment needs required by adults in this age group. The Other Bumi and Indian/Pakistanis showed higher needs for TN 3 than the Malays and Chinese. At this age group the Chinese showed the highest proportion of population who did not require any periodontal treatment compared with the other ethnic groups.

Figure 34 shows the treatment needs for the old age cohort aged 65 years and above by ethnic groups. Although TN 1 and TN 2 are still the commonest treatment required, the percentage of the population who required TN 3 had increased in all ethnic groups. The Indian/Pakistanis showed the highest needs (33.3 %), involving a mean of 0.9 sextant, followed

by Other Bumi at 21.4 per cent (MNS 0.3) and Malays at 16.2 per cent (MNS 0.3). The Chinese showed the least need for TN 3 (only 8.9%), involving a mean of 0.2 sextant, at this age group.

Figure 34



4.2.3.3 Treatment Needs by Area (Urban/Rural) and Gender

Figure 35 shows the treatment needs for periodontal disease by area and gender for age group 15-19 years. It is shown that TN 1 and TN 2 were the two commonest treatment required in the urban and rural areas and by both sexes. The survey also showed that more urban adolescents (20.2 %) did not require any treatment than those from the rural areas (14.8 %). The treatment needs for TN 1 and TN 2 were also less in the urban (79.8 % and 64.2 %

respectively) than in the rural areas (85.2 % and 78.3 % respectively). Males and females showed similar treatment needs at this age group.

Figure 35

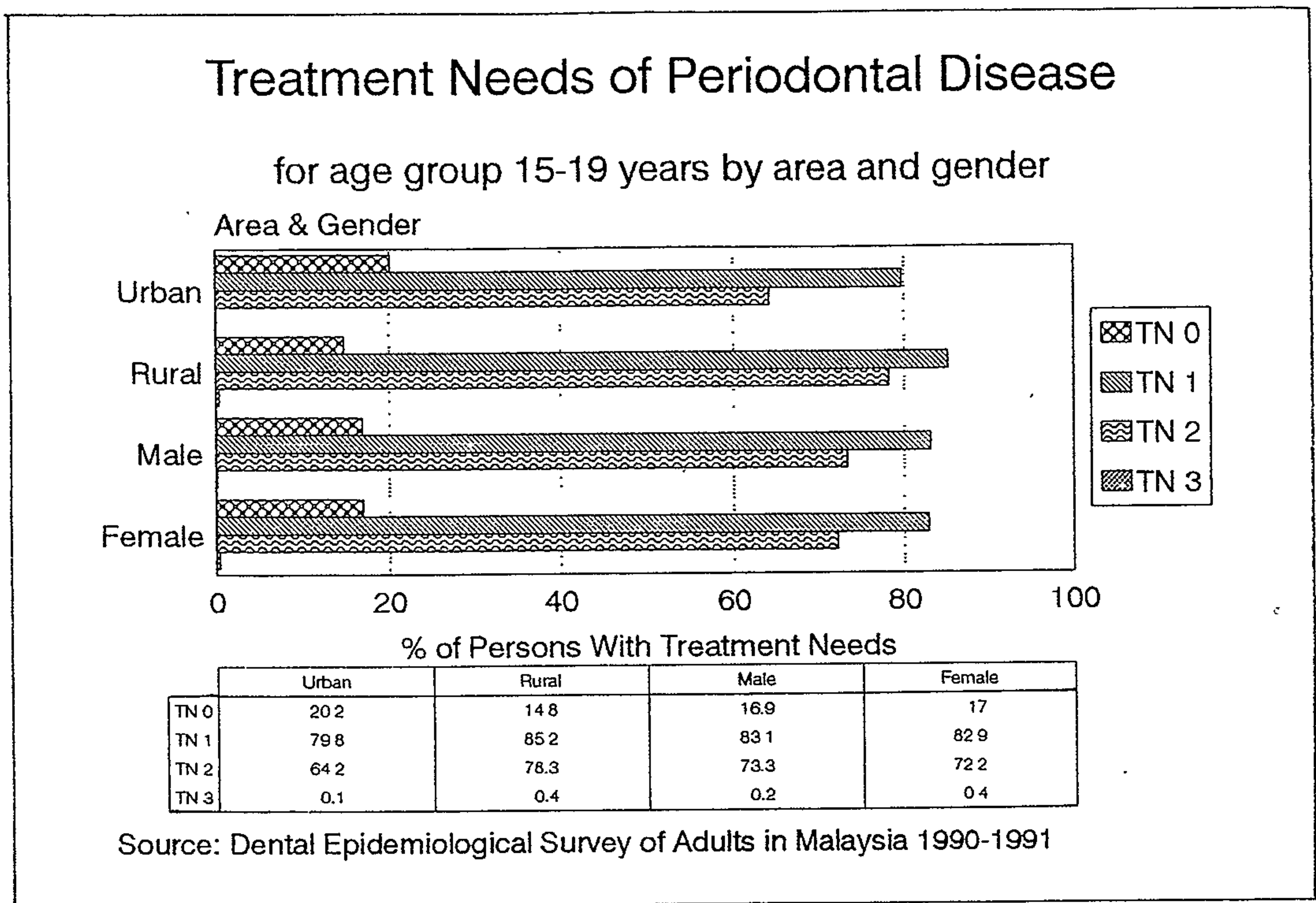


Figure 36 shows the periodontal treatment needs in the urban and rural populations, and for males and females aged 35-44 years. It is shown that the needs for oral hygiene instruction (TN 1) and scaling plus OHI (TN 2) were the commonest treatment needs for both categories. The need for complex periodontal treatment (TN 3) was higher in the rural (10.2 %) than in the urban areas (5.7 %), involving a mean of 0.1 sextant in the urban population and 0.2 sextant in the rural population (Figure 34 and 35). Males showed a higher need for complex periodontal treatment (TN 3) than females

at this age group. The figure shows that 10.8 per cent males required TN 3 compared to only 6.9 per cent for females.

Figure 36

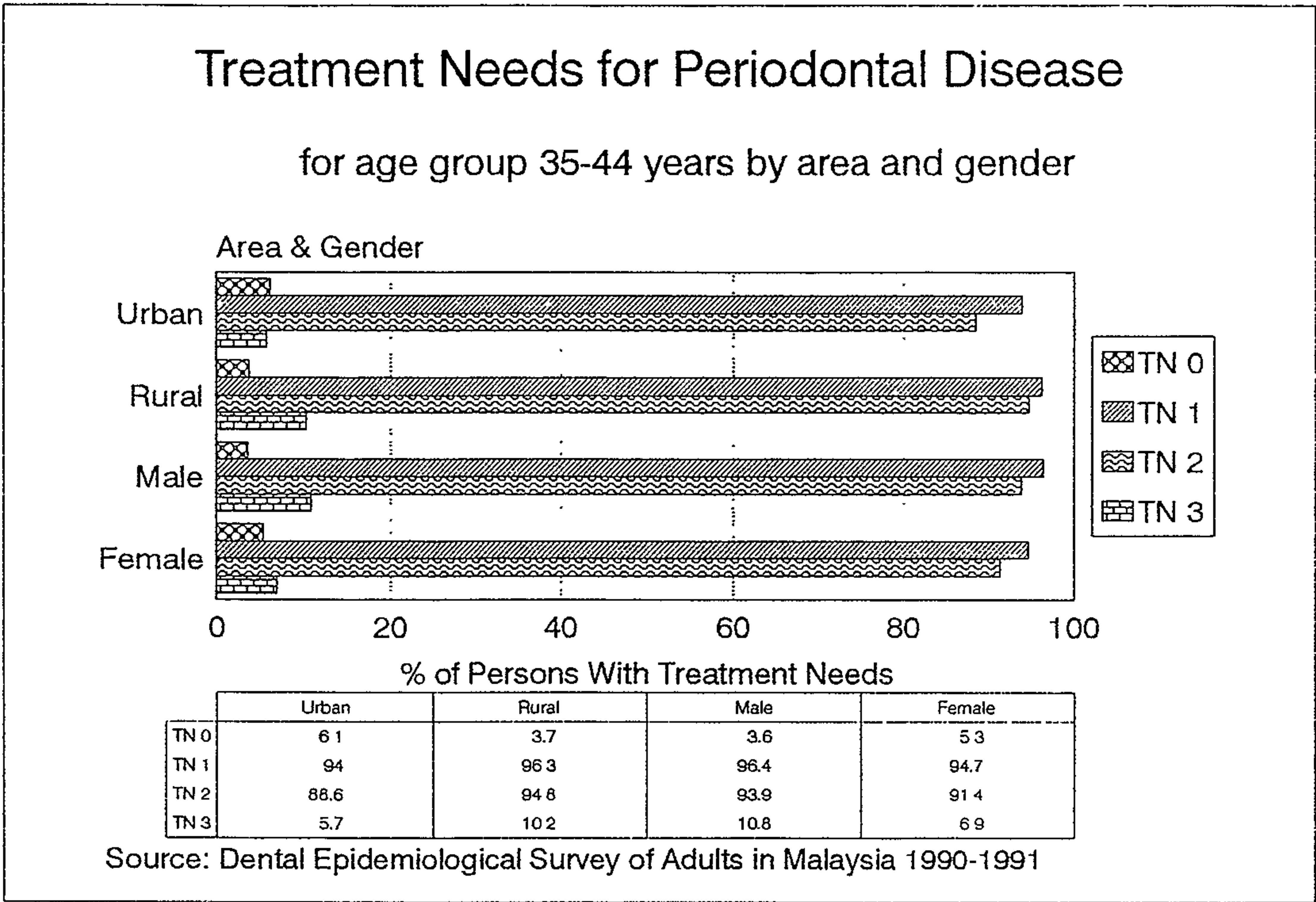
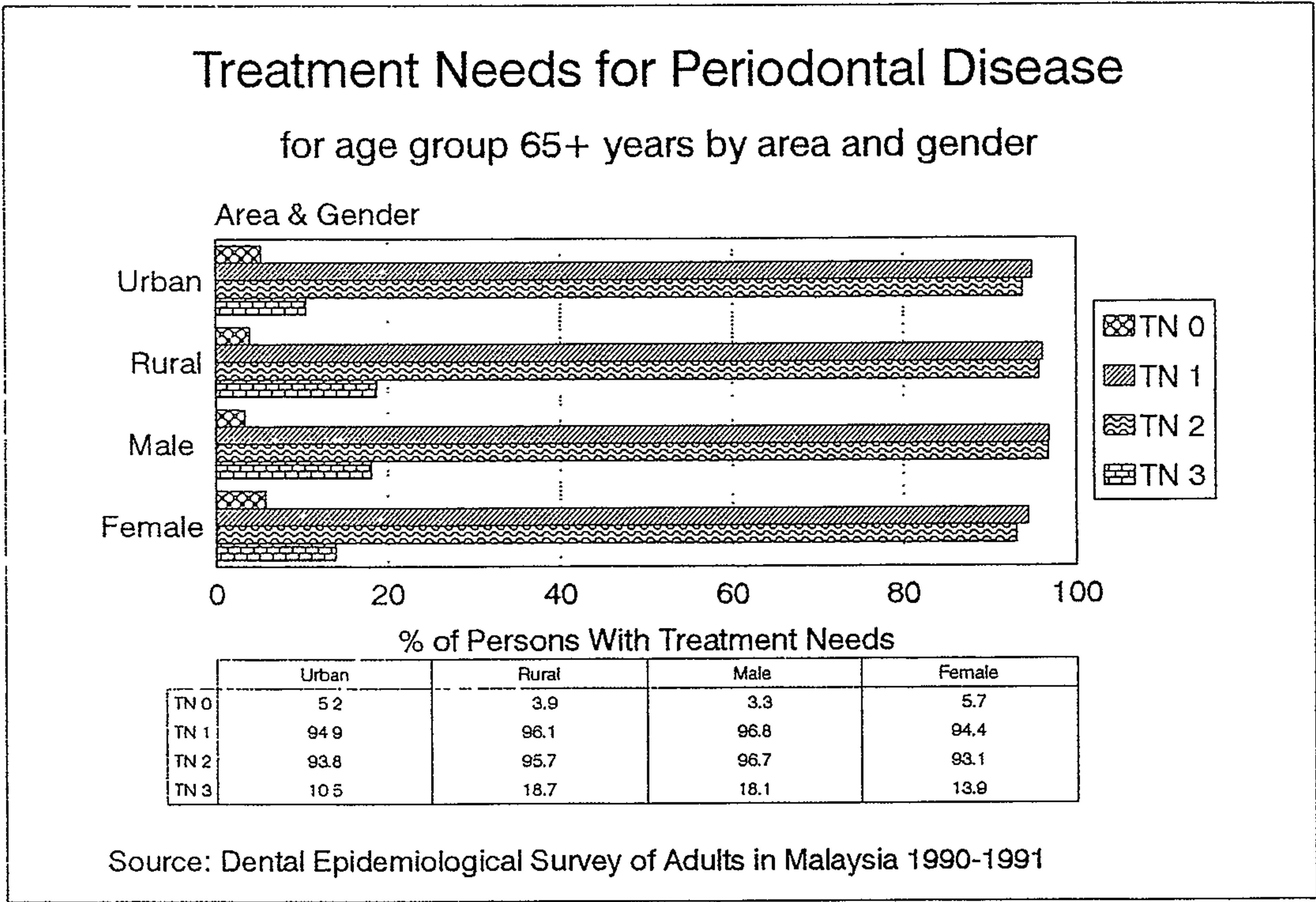


Figure 37 shows the periodontal treatment needs in the urban and in the rural areas, and the treatment needs for males and females for the old age cohort aged 65 years and over. While TN 1 and TN 2 remained as the commonest treatment requirement in this age group, it is shown that there was a big difference in the need for TN 3 between the urban and the rural populations. The survey showed 10.5 per cent of the urban residents required TN 3 with a mean of 0.2 sextant, compared to 18.7 per cent, involving a mean of 0.4 sextant for those in the rural areas. More males (18.1

%) than females (13.9 %) required complex treatment (TN 3) at this age group, involving a mean of 0.3 sextant in each category.

Figure 37



4.3 INTERNATIONAL COMPARISONS OF PERIODONTAL PROFILES

The periodontal profiles of the adolescents and adult populations in Malaysia are compared with the global and regional profiles. The WHO Global Oral Data Bank in the WHO Headquarters in Geneva contains data on CPITN collected from dental epidemiological surveys conducted throughout the world. Analyses of these data have been done by a number of workers. Overviews of the global pattern of periodontal diseases can be seen from these analyses.

4.3.1 Periodontal Profiles of Age Groups 15-19, 35-44 and 65 and over

Figure 6 shows that calculus (CPITN Code 2) was the commonest periodontal condition affecting adolescents in Malaysia. Shallow pocketing was seen in a minority of the population at this age group. This profile is similar to the global profiles as shown by Pilot *et al.* (1987) and Miyazaki *et al.* (1991). Among the adults aged 35-44 years, calculus was the most commonly observed condition followed by shallow pocketing. Deep pocketing was seen in a minority (8.5 %) of the subjects affecting a mean of 0.2 sextant. This again is similar to the global profiles seen by Pilot *et al.* (1986) and Miyazaki *et al.* (1991). Among the old age cohort aged 65 years and above the mean number of excluded sextants of 2.6 seemed to be higher than that observed by Pilot *et al.* (1992) who stated that at age 70 almost 2.5 sextants were excluded.

4.3.2 Comparison With Some Countries in the Western Pacific Region

Comparisons are made between the periodontal profiles in Malaysia and the data on periodontal diseases in some member countries of the Western Pacific Region of the WHO in the 15-19, 35-44 and 65 and over age groups which are stored in the WHO Global Oral Data Bank (Miyazaki, Pilot and Leclercq 1992).

Figure 38

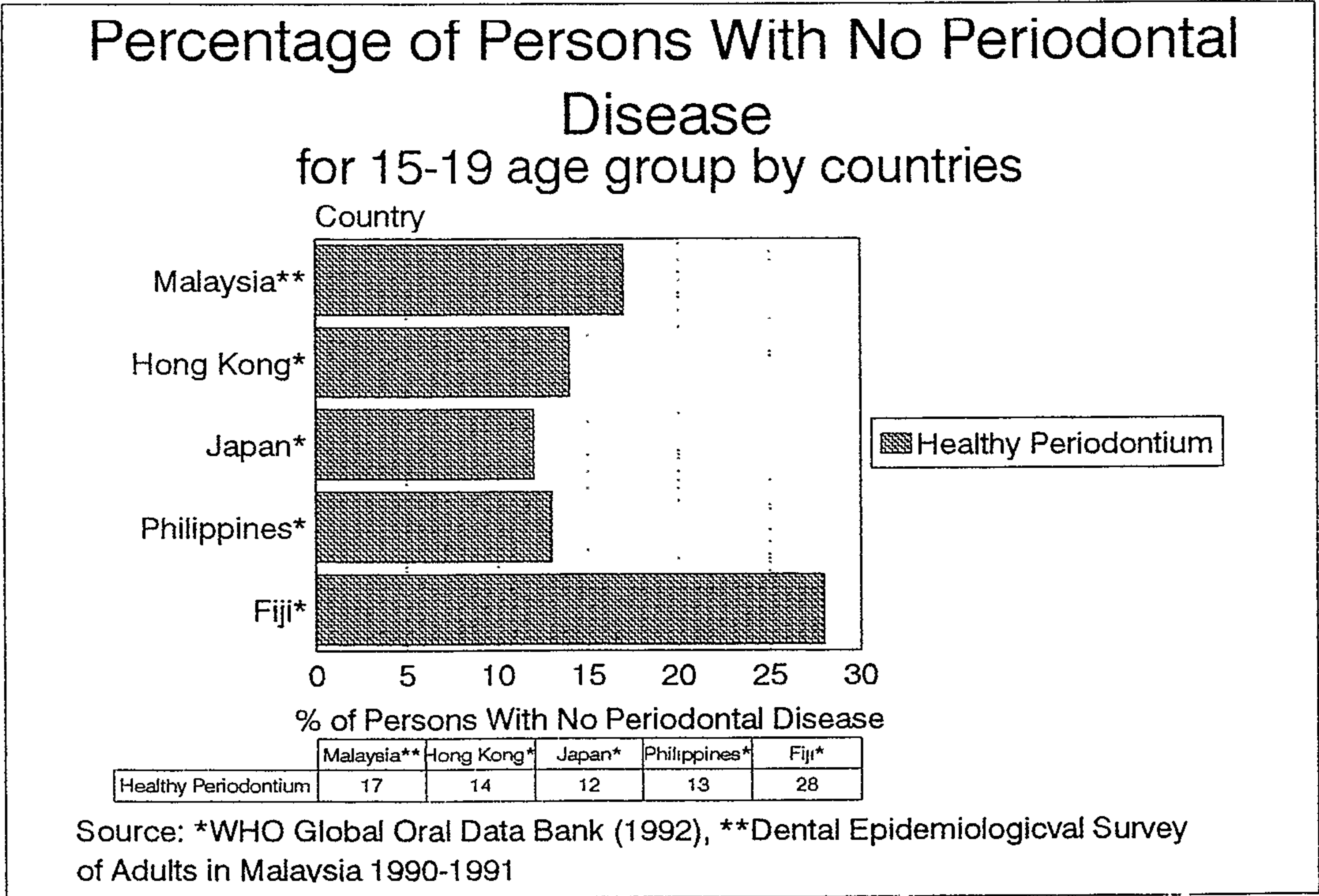


Figure 38 shows the percentage of adolescents aged 15-19 years who did not have any periodontal disease in some of the countries in the Western Pacific Region of WHO (WPRO). It is observed that the adolescents aged 15-19 years in Malaysia had better periodontal health than those in some other

countries in the Western Pacific Region, namely Hong Kong, Japan, and Philippines. However, their counter-parts in Fiji seemed to have better periodontal health.

Figure 39

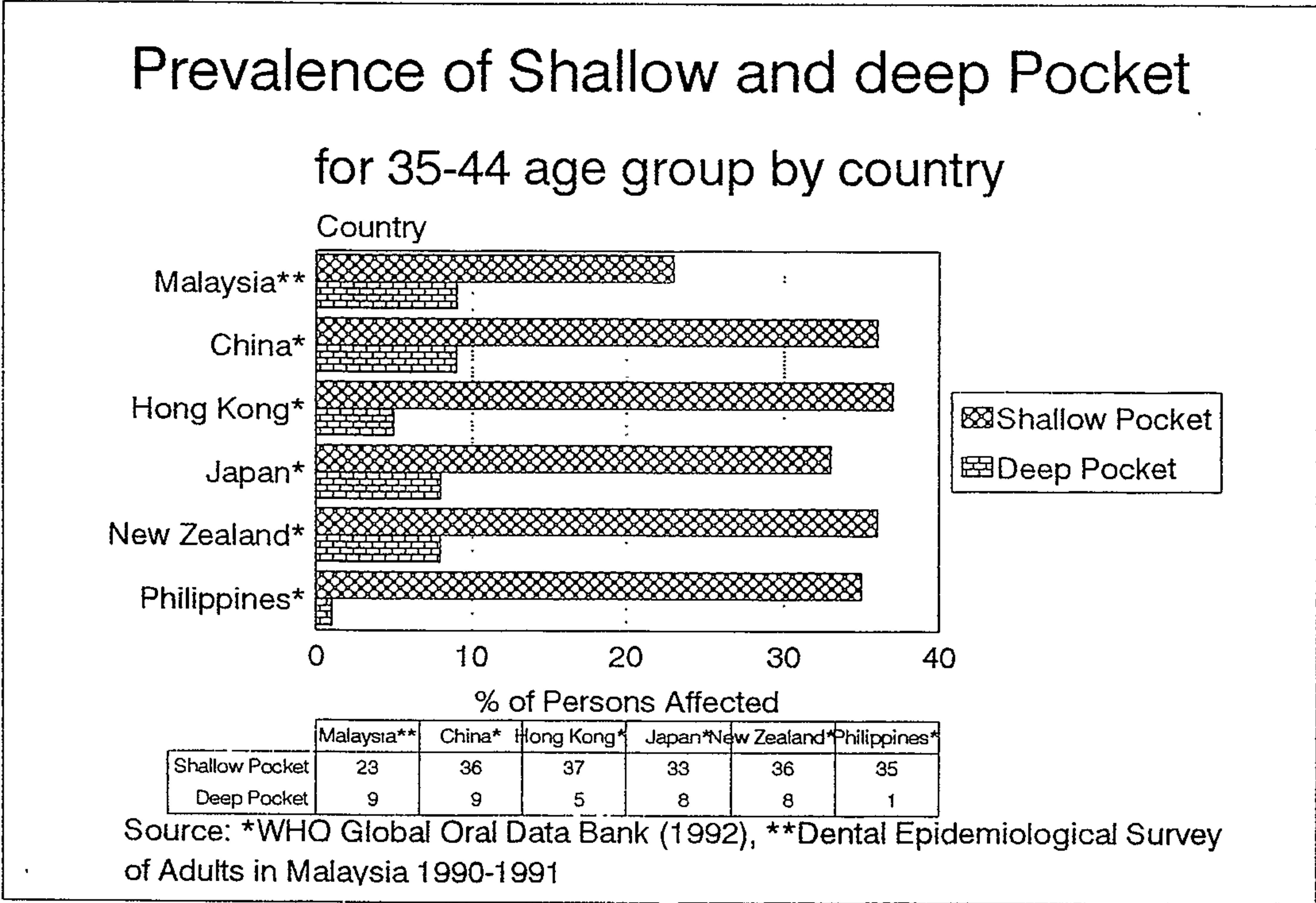


Figure 39 shows the prevalence of shallow and deep pocketing among the 35-44 year-olds in some member countries of WPRO. It is observed that the prevalence of shallow periodontal pocket among adults aged 35-44 years in Malaysia was lower than those found in China, Hong Kong, Japan, New Zealand and the Philippines. The prevalence of deep pocketing was similar to those found in China, Japan and New Zealand. The prevalence of deep pocket in the Philippines was the lowest in the region among this age group.

Figure 40

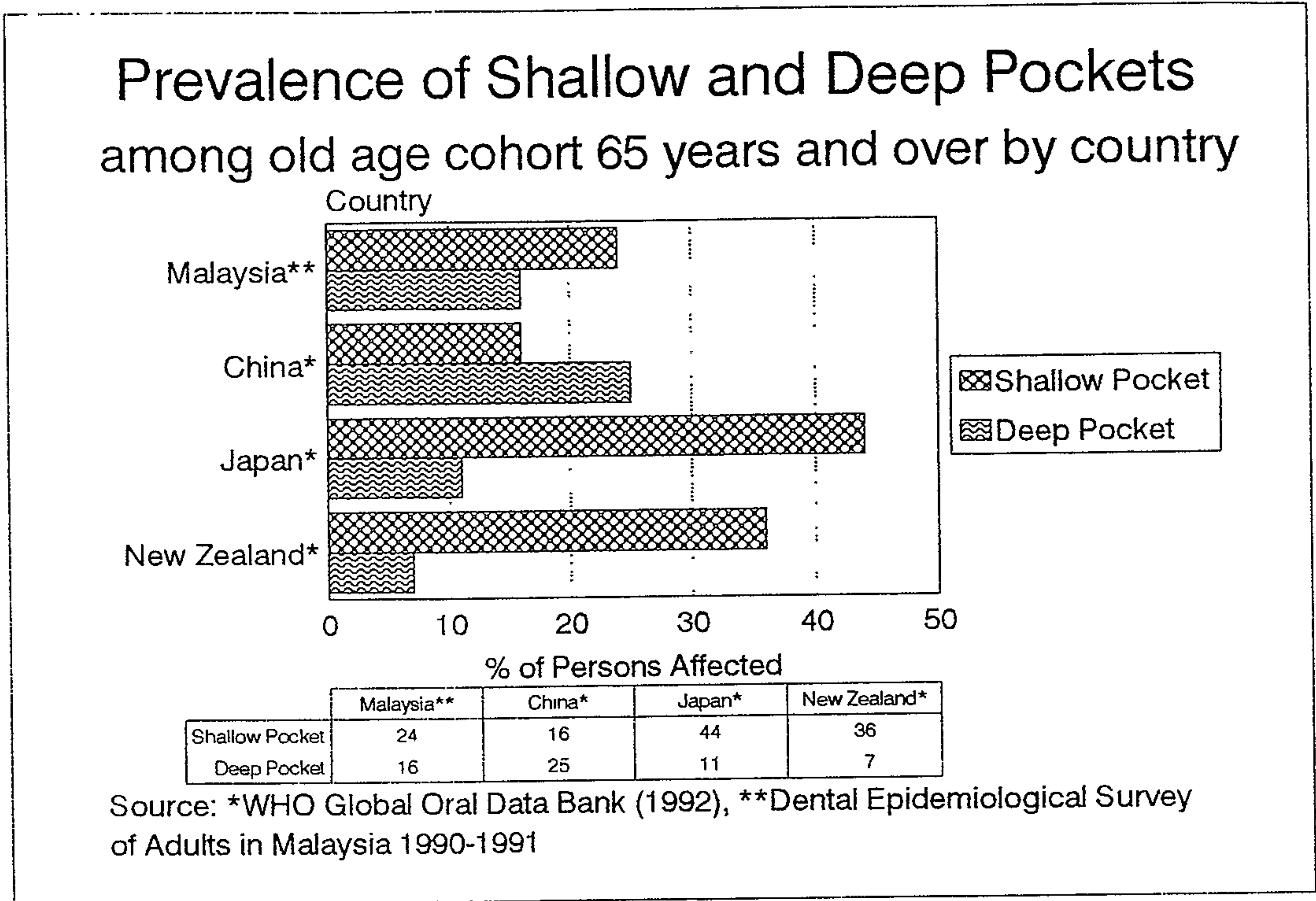


Figure 40 shows the prevalence of shallow and deep pocketing in the old age cohort aged 65 years and above in some member countries of WPRO. The prevalence of shallow pocket in the old age group of 65 and over in Malaysia was higher than that found in China, but lower than those found in Japan and New Zealand. The prevalence of deep pockets higher than those found in Japan and New Zealand, but lower than that found in China, which surprisingly showed a higher prevalence than shallow pocket.

4.4 SUMMARY OF FINDINGS IN FURTHER ANALYSES

Apart from the highlights which were revealed by the initial analyses of the results of the Dental Epidemiological Survey of Adults in Malaysia 1990-1991, the further analyses of the results of the survey have also highlighted the following features about the periodontal profiles of the adult populations in Malaysia:

1. Dental calculus was the most frequently observed condition in all age groups, and it seemed to decrease with age (**Figure 6**) mainly due to a corresponding increase in the prevalence of periodontal pocketing with age (**Figure 7**).
2. The Indian/Pakistanis were observed to have better periodontal health at younger age groups up to the age of 29 years compared with the other ethnic groups. But from the age of 30 to 54 years the Chinese were observed to have better periodontal health than the other ethnic groups. The Other Bumis were observed to have the least percentage of population with healthy periodontium from the age of 15 to 44 years compared with the other ethnic groups (**Figure 8**).
3. The Other Bumis showed a noticeably higher prevalence of shallow pocket than the other ethnic groups over all age groups (**Figure 9**).
4. The Malays and Other Bumis seemed to show a decrease in the prevalence of dental calculus, and a corresponding increase in the prevalence of periodontal pocketing with age (**Figures 11 and 12**).

5. In the Chinese the prevalence of dental calculus did not show any obvious variation with age. Eventhough the prevalence of pocketing showed a noticeable increase with age, from 3.4 per cent at age group 15-19 years to 27.8 per cent among those aged 65 years and over, it was observed to be the lowest among all the ethnic groups (**Figure 14**).
6. Although the Indian/Pakistanis showed the highest percentage (9.1 %) of those aged 65 years and over with healthy periodontium, they also showed the highest prevalence (33.3 %) of deep periodontal pocket among all the ethnic groups in the same age group (**Figure 14**).The prevalence of deep pocket showed a marked increase after the age of 35 years from 10.1 per cent at age group 35-44 years to 33.3 per cent in those aged 65 years and above (**Figure 10**), and the prevalence of shallow and deep pocketing increased drastically from 29.7 per cent for age group 35-44 to 45.4 per cent among those aged 65 years and above **Figure 15**).
7. The urban and rural populations showed similar prevalence of shallow periodontal pocket at younger age groups up to the age of 29 years, and after this age the rural population showed a higher prevalence than those in the urban areas (**Figure 16**).
8. The trend of prevalence of deep periodontal pocket showed no noticeable difference between the urban and the rural populations up to the age of 24 years. From the age of 25 years and above the rural populations showed a markedly higher prevalence than those in the

urban areas (Figure 17).

9. At the age of 15-19 years, the urban adolescents showed a higher percentage (20.2 %) with healthy periodontium than those in the rural areas (14.7 %). The rural adolescents showed a higher prevalence (73.3 %) of dental calculus than their urban counter-parts with 61.2 per cent affected (Figure 18).
10. At the age of 35-44 years 6.1 per cent of the urban population were found to have healthy periodontium compared with only 3.7 per cent of those from the rural areas. Although more of the urban population in this age group (64.2 %) were found to have dental calculus than those from the rural areas (58.4 %), only 24.4 per cent of them had periodontal pocket compared with 36.4 per cent of those from the rural areas (Figure 19).
11. In the old age cohort aged 65 years and over, 28.9 per cent of those in the urban areas had periodontal pocket compared with 45.2 per cent of those from the rural areas (Figure 20).
12. The percentages of females with healthy periodontium were higher than those of males over all age groups, and the percentages of both females and males with healthy periodontium decreased with age (Figure 21).
13. From the age of 25 to 64 years males showed a higher prevalence of shallow pocket than females (Figure 22).
14. From the age of 15 to 34 years males and females showed a similar prevalence of deep pocket. But from the age of 35 to 64 years males

showed a higher prevalence than females (Figure 23).

15. The severity of shallow periodontal pocket, based on the mean number of sextants affected, seemed to increase with age from MNS 0.1 for 15-19 age group to 0.9 for 45-54 age group, after which it seemed to level off. Deep periodontal pocket did not seem to be a major problem, affecting only a mean of 0.2 sextant at 35-44 years and 0.3 sextant in those aged 65 years and above (Figure 24).
16. The mean number of edentulous sextant increased with age from 0.1 at age 20-24 years to 2.6 in those aged 65 years and over (Figure 25).
17. The mean number of teeth present (MNT) decreased gradually with age from 28.2 at 15-19 age group to 11.6 among those aged 65 years and above in 1990. The MNT had shown an overall increase compared with that found in 1974. Among those aged 65 years and above it had increased from 7.5 in 1974 to 11.6 in 1990 (Figure 26).
18. The prevalence of edentulousness increased markedly from 2.2 per cent at the age group 30-34 years to 56.6 per cent among those aged 65 years and over (Figure 27).
19. Based on the mean number of affected sextants, it was observed that pocketing was more severe in the rural population compared with those from the urban areas over all age groups above the age of 20 years (Figure 28).
20. It was observed that the rural population had more severe deep periodontal involvement compared with their urban counter-parts after the age of 35 years (Figure 29).

21. The commonest treatment needs for all age groups were TN 1 (OHI) and TN 2 (scaling and OHI). Complex periodontal treatment was required by only a small proportion of the population (**Figure 30**).
22. It was observed that there was an inverse relationship between the percentage of those who required TN 3 and those who did not require any treatment or TN 0 (**Figure 31**).
23. In the 15-19 age group the Other Bumis showed higher needs for TN 1 and TN 2 than the other ethnic groups. The Indian/Pakistani showed the lowest needs for TN 1 and TN 2 than the other ethnic groups (**Figure 32**).
24. In the 35-44 age group the Other Bumis and the Indian/Pakistanis showed higher needs for TN 3 than the Malays and Chinese. At this age group the Chinese showed the highest percentage of population who did not require any treatment compared with the other ethnic groups (**Figure 33**).
25. In the old age cohort aged 65 years and over, TN 1 and TN 2 were still the commonest treatment needs required. But the percentage of those who required TN 3 had increased in all ethnic groups compared with the younger age groups. The Indian/Pakistanis showed the highest need for TN 3 (33.3 %), involving MNS 0.9, followed by Other Bumis at 21.4 per cent (MNS 0.3) and the Malays at 16.2 per cent (MNS 0.3). The Chinese showed the least need for TN 3 at only 8.9 per cent, involving a mean of 0.2 sextant (**Figure 34**).

26. It was shown that more urban adolescents did not require any periodontal treatment compared with those in the rural areas (urban 20.2 %, rural 14.8 %). The needs for TN 1 and TN 2 were lesser in the urban population than in the rural population. Males and females showed similar treatment needs at this age group (**Figure 35**).
27. In the 35-44 age group, the need for complex periodontal therapy was higher in the rural population (10.2 %) than in the urban population (5.7 %), involving MNS 0.2 in the rural population and 0.1 in the urban population. It was shown that 10.8 per cent males required TN 3 compared with only 6.9 per cent of the females (**Figure 36**).
28. In the old age group 65 years and over, it was shown that there was a big difference in the need for TN 3 between the urban and rural populations (10.5 % urban, 18.7 % rural), involving a mean of 0.2 sextant in the urban population and 0.4 sextant for the rural population. It was also shown that more males (18.1 %) than females (13.9 %) required TN 3 at this age group, involving a mean of 0.3 sextant in each category (**Figure 37**).
29. The periodontal profiles seen in the age groups 15-19 and 35-44 years were similar to the global profiles shown by Pilot *et al.* (1986), Pilot *et al.* (1987), Miyazaki *et al.* (1991), and Miyazaki *et al.* (1991a). In the old age group of 65 years and over, the mean number of 2.6 excluded sextants seen in the Malaysian survey was higher than global mean shown by Pilot *et al.* (1992), who stated that at the age of 70 years almost 2.5 sextants were excluded.

30. The adolescents aged 15-19 years in Malaysia seemed to have better periodontal health than their counter-parts in Hong Kong, Japan and Philippines but not as good as those in Fiji (**Figure 38**).
31. It was observed that the prevalence of shallow periodontal pocket among adults aged 35-44 years in Malaysia was lower than those seen in China, Hong Kong, Japan, Philippines and New Zealand. The prevalence of deep periodontal pocket was similar to those found in China, Japan and New Zealand. The Filipinos showed the lowest prevalence of deep periodontal pocket among adults in this age group in this region (**Figure 39**).
32. The prevalence of shallow periodontal pocket in the old age group aged 65 years and above was higher in Malaysia compared with those found in China, but lower than those found in Japan and New Zealand. The prevalence of deep periodontal pocket was higher than those found in Japan and New Zealand, but lower than those found in China, which surprisingly was higher than the prevalence of shallow periodontal pocket (**Figure 40**).

5 DISCUSSION AND CONCLUSION

5.1 DISEASE PROFILES

Despite some doubts about the reliability of the index, CPITN has proven to be useful in helping to map out the periodontal status and treatment needs in many countries throughout the world. Analyses of the data on CPITN in the WHO Oral Data Bank have revealed a clearer insight into the periodontal profiles in many countries and thus enabling international comparisons to be made regarding the status of periodontal health. The age groups normally taken for international comparisons are 15-19 years, 35-44 years and the older age cohorts aged 45-54 years, 55-64 years and the old age cohort of 65-74 years.

It is now recognised that though the prevalence of periodontal disease is high in most countries, the disease does not seem to be a major public health problem as a relatively small percentage of the population suffer from irreversible stages of the disease before the age of 40 years, and the disease seldom leads to tooth loss before the age of 50 years. It seems to be a problem in the old age groups affecting 5 to 20 percent of those age 65 years and over.

Although calculus is found to be more prevalent in the adolescents in the developing countries than in the industrialised countries, there does not

seem to be any obvious difference in the prevalence of periodontal disease between the adults aged 35-44 years, 45-54 years, 55-64 years and those aged 65 years and over in the industrialised countries and those in the developing countries. The assumption that people living in industrialised countries would have better periodontal health than those from developing countries does not show in the periodontal health status as it does in the caries status.

The periodontal health status in Malaysia, shown in the results of the Dental Epidemiological Survey of Adults in Malaysia 1990-1991, has been found to be comparable with the global profiles for the adolescents and the younger adults age 35-44 years. However, in the old age cohort aged 65 years and over, Malaysians seem to lose more teeth as reflected in a slightly higher mean number of excluded sextants (2.6) than the global average shown by Pilot *et al.* (1992) who stated that at age 70 years almost 2.5 sextants are excluded.

Further analyses of the results of the Dental Epidemiological Survey of Adults in Malaysia 1990-1991 have provided a more comprehensive overview of the periodontal health status in the country. The analyses have shown that the periodontal disease conditions did not seem to be a major public health problem in the country although 92.8 per cent of those aged 15 years and over were affected. Only 6 per cent of the adult population were affected by the irreversible stages of periodontitis. The prevalence is higher in the elderly group, affecting 16.4 per cent of those aged 65 years and over.

Comparisons between the ethnic groups have shown that the Other Bumis had more periodontal disease problems than the other ethnic groups. This is understandable since most of the group stay in the lesser developed eastern states of Sarawak and Sabah and most of them reside in the rural areas. The rural population showed a higher prevalence of periodontal diseases than those in the urban areas. This could be due to a number of factors, including the following:

- i. lower socio-economic status;
- ii. lesser accessibility to dental facilities;
- iii. lesser number of dental facilities in the rural areas compared with the urban areas.

5.2 CONCERNS ABOUT THE CPITN INDEX

Chapter 3 has dealt with some claims about the reliability and validity of CPITN, and concerns about some of the weaknesses of the index have also been raised. The reasons for the concern about the reliability and validity of the index will be discussed henceforth. The author will suggest a modified recording system in order to solve the problem.

5.2.1 Background of the Problems Associated With the Index

Concerns about the reliability and validity of the Community Periodontal Index of Treatment Needs arise from the fact that the index was originally meant for assessing periodontal treatment needs and not for assessing periodontal disease status (Ainamo *et al.* 1982). As the usage of the index was extended to include the assessment of disease prevalence, the recording of the highest score for the assessed conditions seemed to disregard the existence of other less serious conditions which might co-exist with those more serious ones. However some investigators contended that for epidemiological purposes the recordings of the worst periodontal conditions as a means of assessing disease prevalence and their resultant treatment needs would suffice.

Holmgren and Corbet (1990) questioned the assumption that there is a close concordance between calculus and gingivitis. Garre *et al.* (1990) have shown that toothbrushing alone has decreased bleeding in a population with heavy

calculus deposits. Takahashi *et al.* (1988) found that a substantial proportion (38-52 %) of the subjects they examined had calculus but did not exhibit any bleeding on probing. They suggested that a modified form of recording be used to differentiate those with calculus and bleeding from those with calculus and no bleeding. Several investigators had suggested that a distinction be made between supra- and subgingival calculus (Sivaneswaran 1985; Takahashi *et al.* 1988).

Based on the CPITN methodology, it is presumed that a sextant which is recorded to have periodontal pocket will also have calculus and exhibits bleeding on probing. When there is calculus, it is assumed that it will bleed on probing. The possibilities of various combinations of periodontal conditions other than those stated above are discounted. This has caused much concern among some investigators.

5.2.2 Binary Recording System

The author suggests a binary system of recording alluded to by Takahashi *et al.* (1988), who used code 2+ for calculus with bleeding and 2- for calculus without bleeding. The possibilities of the existence of pocket with calculus which does not bleed on probing, and pocket without calculus or bleeding should also be considered. In order to do this the author suggests a modified coding system for CPITN which will record all possible combinations of periodontal conditions considered relevant for the discussion of disease prevalence and treatment needs in the CPITN methodology.

In this binary system the first digit indicates the main condition, whereas the second digit indicates the existence or absence of associated conditions (i.e. calculus and bleeding on probing). The proposed modified coding system for CPITN is shown in Figure 41 below.

Figure 41

Binary Codes For Recording Periodontal Conditions Using CPITN

CPITN Code		Condition
Single No.	Binary Code	
4	41	Deep pocket + Calculus + Bleeding
	42	Deep pocket + Calculus - Bleeding
	43	Deep pocket - Calculus + Bleeding
	44	Deep pocket - Calculus - Bleeding
3	31	Shallow pocket + Calculus + Bleeding
	32	Shallow pocket + Calculus - Bleeding
	33	Shallow pocket - Calculus + Bleeding
	34	Shallow pocket - Calculus - Bleeding
2	21	Subgingival Calculus + Bleeding
	22	Subgingival Calculus - Bleeding
	23	Supragingival Calculus + Bleeding
	24	Supragingival Calculus - Bleeding
1	10	Bleeding
0	00	Healthy
X	X1	Excluded sextant with one tooth
	X2	Edentulous sextant

An example of a recording using this proposed coding system is shown below:

42	21	34
33	10	X1

This chart shows that this subject has a deep periodontal pocket and calculus but no gingival bleeding in the upper right sextant. He has subgingival calculus and bleeding in the upper central sextant. In the upper left sextant the index tooth shows the existence of a shallow pocket with no calculus and no bleeding. In the lower jaw he has a shallow pocket which bleeds on probing although there is no calculus detected. The lower left central incisor shows only bleeding on probing. The lower left sextant has only one tooth left, and it is excluded.

The use of the binary system for the recording of periodontal conditions will enable a more realistic estimate of disease prevalence since no existing periodontal condition is disregarded or no non-existent condition is presumed to be present. In this way the index will be more accurate for estimating both the prevalence as well as the treatment needs of periodontal disease. Since the first digit still maintains the code number for recording each periodontal condition in the current index, it will enable comparisons to be made with the existing data on CPITN.

5.3 MANPOWER CALCULATION USING CPITN

One of the major shortcomings of CPITN is that it does not have a component for the calculation of the required workforce for the treatment of the assessed disease conditions, similar to the one for assessing its treatment needs. Ainamo *et al.* (1982), in reporting the development of the index, had stated that a methodology for calculating workforce requirement in association with the index would be developed. However, to date no such methodology has been developed.

5.3.1 Based on the Modified WHO (1978) Time Estimates

In the absence of such methodology Manji and Sheiham (1988) had attempted to calculate the manpower requirement based on the quadrant time estimates proposed by WHO (WHO 1978) by converting the quadrant times into sextant times. Following the examples by these investigators the author had attempted to calculate the manpower requirement for Malaysian adults by using the CPITN data obtained in the Dental Epidemiological Survey for Adults in Malaysia 1990-1991. The sextant time estimates and the calculations are shown in **Appendices 12 to 23**.

Based on the methods stated above, it would take 14 049 dentist- years to carry out treatment procedures on the periodontal conditions in the adolescent and adult populations of Malaysia (1990) aged 15 years and over, based on the following assumptions:

- i. that all who were found to have disease conditions would seek and be given treatment;
- ii. that each dentist would spend 220 days a year and 8 hours a day giving periodontal treatment;
- iii. that each patient requires only one treatment visit and one follow-up visit for TN 2 and TN 3.

The summary of the manpower requirement for the various age groups obtained using this method of calculation is shown in **Appendix 24**.

The manpower requirement obtained by the method of calculation stated above is far beyond the available manpower resources in the country. Even if we were to adjust this requirement to the rate of utilisation of public dental services in the country, which was 18.5 per cent in 1990 (**Ministry of Health, Malaysia 1991**), it would have taken 2600 dentist-years to treat the existing dental conditions. And assuming that the private sector would cover half of the problem, it would still take 1300 dentist-years for each sector to treat the existing periodontal conditions. It would take almost a year for all dentists in Malaysia to treat 18.5 per cent of those who had periodontal conditions in 1990 if they worked exclusively in treating those conditions throughout the year. The enormous volume of workforce required for the treatment of the periodontal conditions would suggest that preventive services should be preferred, with allowance for treatments for those who seek them. Emphasis should be on dental health education as part of the preventive services on a community basis.

5.3.2 Based on Butterworth and Sheiham's Time Estimates

Butterworth and Sheiham (1991) explored another way to calculate the manpower requirement in association with CPITN. They found that the mean treatment time to carry out periodontal therapy on each patient was 14.7 minutes regardless of the conditions. Applying this time estimate to the Malaysian populations based on the estimated affected population obtained in the adult survey mentioned above, it would take 1,450 dentist-years to treat the perceived periodontal conditions as shown below.

Estimated Population (A)	= 11 221 100
% Requiring Treatment (B)	= 92.8
Estimated Treatment Time Per Person (C)	= 14.7 min.
∴ Total Treatment Time	= $\frac{A \times B \times C}{480 \times 220}$
	= 1450 dentist-years

Both methods gave manpower estimates which are beyond the resources of the country, which has only 692 dentists and specialists in the public sector and 746 dentists and specialists in the private sector in 1990 (Ministry of Health, Malaysia 1993a).

The weakness of both methods of calculation is that they were based on a one-to-one basis between a dentist and a patient, which essentially is a clinical approach. Each patient was regarded as a clinical case and treated

that way even though the condition could be resolved by self-care. The calculation for the manpower requirement was not based on a community approach for which the index was originally intended for.

Essentially, according to public health concept, based on a community approach, TN 1 does not require any clinical or professional intervention. Only TN 2 and TN 3 would require professional intervention on a one-to-one basis by either a dentist or an auxiliary for TN 2 and by a dentist or a specialist for TN 3.

In the community approach the dentists and dental auxiliaries would function primarily as educators or facilitators of dental health education. Dental conditions which could not be resolved by self-care would then be treated by the dental personnel which may include dental auxiliaries. In countries where dentists are in short supply, dental therapist, dental hygienist or dental nurses could be deployed to conduct dental examinations and to do scaling and polishing procedures on adults. Malaysia has dental nurses who work almost exclusively in the school dental programme. Recently their duties have been extended to cover pre-school children and toddlers. They can only treat children up to the age of 17 years. There were 1105 dental nurses compared with 692 dentists in the public sector in 1990 (**Ministry of Health, Malaysia 1993a**).

The proposal to make use of dental nurses to do scaling and chair-side oral health education on adults in Malaysia has been included as one of the recommendations to redress the high prevalence calculus in adults by the research committee of the survey (**Ministry of Health, Malaysia 1993a**). With this expanded role there will be a need to conduct post-basic training for such nurses to equip them with the knowledge to carry out such procedures for which they were not trained on initially. In connection with this their line of duties has to be redefined and legislation to allow dental nurses to treat adolescents and adult patients above 17 years of age should be incorporated.

To distinguish the dental nurses who could treat adult patients and are attached to dental clinics in the hospitals or health centres, they should be redesignated as dental therapists. This new category of auxiliary should be recruited from the existing dental nurses as a form of promotional post. As an incentive for dental nurses to opt for this post they should be placed on a salary scale higher than that for dental nurses by virtue of the extra training they have to undergo in order to qualify for this post. Only senior nurses with good service records should be considered for further training for this post.

Even though it has been stated that periodontal disease is not a major public health problem in Malaysia, certain strategies must be planned to reduce its high prevalence. Since it would be impossible to cover the whole

range of the population, it would be sensible to choose priority groups based on the disease prevalence and the perceived trend of the disease progression over the various age cohorts.

In Malaysia the school dental service has been quite well established, covering 46.9 per cent of the primary school population and 25.8 per cent of the secondary school population in 1992 (**Ministry of Health, Malaysia 1993b**). The services in the primary and secondary schools continue to be upgraded annually. This means that the needs of the younger generations have been quite well catered for.

The adults aged 30-34 years seemed to be a vulnerable age group, where the rate of edentulousness begins to increase, and the prevalence of pocketing has begun to show an increase, especially in the rural population. At this age group it was also seen that there was an equilibrium between those who required complex treatment and those who did not require any treatment (**Figure 31**). Therefore the author feels that this age group should be treated as a priority group. Since this group also comprises a large proportion of the active workforce in the country, it would be worthwhile to consider bringing preventive and curative services to their work place wherever possible. In line with this, the research committee had identified certain captive groups such as the arm forces, the police force, fire brigades and staff of other government departments as target groups. The ante-natal mothers, a large proportion of whom are within this age group, have been

designated as a priority group and they have been given systematic and incremental dental care in public clinics.

The needs of the elderly population who suffer from the late stages of periodontitis should be considered. The research committee had recommended that the knowledge in gerodontology should be upgraded among the dentists in Malaysia (**Ministry of Health, Malaysia 1993a**). This discipline should be included in the undergraduate curriculum of the dental faculty in the country.

5.4 PERIODONTAL HEALTH GOALS

In 1979 the World Health Assembly adopted a resolution calling for the attainment of *"Health for all by the year 2000"*. In line with this the Federation Dentaire Internationale (FDI) recommended the establishment of specific oral health goals on the same time scale. The ultimate aim was to achieve complete oral health for all, with optimal function of teeth, jaws and associated structures. The first global goal for oral health was formulated in 1979: no more than 3 DMF teeth at 12 years of age. Following this, four other goals were added two years later.

The five global goals are:

Age (Yrs)	Goal
5-6	50% should be free of dental caries
12	3 or fewer decayed, missing, or filled teeth
18	85% should retain all their teeth
35-44	A 50% reduction in 1981 levels of edentulousness
65 and over	A 25% reduction in 1981 levels of edentulousness

These goals were established as a guide for countries in developing their own goals. Following this, member countries of the FDI and WHO were encouraged to collect baseline data as rapidly as possible so that they could develop their own national goals that relate to existing levels of disease and programmes to achieve those goals (WHO 1984a).

In conjunction with this, the WHO saw the need for developing global goals for periodontal diseases. It was suggested that the CPITN be used to obtain reliable baseline data since the available data were assessed as insufficient at that time (**WHO 1984a**). The recommended periodontal health goal for member states in the Western Pacific Region of the WHO was 25 per cent or less of the population aged 15-19 years with CPITN 2.

5.4.1 Periodontal Health Goals for Malaysia

The results of the Dental Epidemiological Survey of Adults in Malaysia 1990-1991 would permit a reasonable basis for setting realistic oral health goals in respect of periodontal diseases for the year 2000 in order to permit more realistic and periodic assessments of the dental care services in the country.

Based on the data obtained from the survey quoted above, it would be reasonable to set the following goals of periodontal health for the Malaysian population:

- i. at 20 per cent of those aged 15-19 years having no periodontal problem (up from the level of 16.9 per cent in 1990), with a mean number of healthy sextant of 3.5 (up from a mean of 3 in 1990) by the year 2000.
- ii. a modest reduction to 60 per cent from 68.5 per cent (in 1990) of the age group 15-19 years with CPITN 2 by the year 2000. The WHO set goal of 25 per cent of the age group 15-19 years with CPITN 2 (**WHO 1984a**) will not be achieved in the country by the year 2000.

- iii. a modest reduction of the level of edentulousness to 6 per cent by the year 2000 from 7.3 per cent in 1990 for the age group 35-44 years, and from 56.6 per cent to 50 per cent for those aged 65 years and over during the same time period.
- iv. the mean number of teeth present among those aged 65 years and over will be expected to increase from 11.6 in 1990 to 12.5 by the year 2000.

These goals could be achieved through the following approaches:

- i. by implementing the strategies recommended by the research committee of the survey;
- ii. by the constant upgrading of the school dental services in primary and secondary schools throughout the country;
- iii. by upgrading of some of the existing dental nurses into dental therapists to undertake TN 1 and TN 2 in the adult populations. In essence, this is part of the recommendations forwarded by the research committee.

5.5 AVENUES FOR FURTHER RESEARCH AND DEVELOPMENT

In order for CPITN to be useful as public health tool for the planning of dental manpower, the methodology for the calculation of manpower requirement, based on the assessed disease prevalence and treatment needs, has to be developed. A computer software programme for data analyses and manpower calculation should be developed and made readily available upon request from any WHO office.

Some of the findings highlighted by the further analyses of the data obtained from the Dental Epidemiological Survey of Adults in Malaysia 1990-1991 may be of interest to researchers. Among these are the following:

- i. The reasons for the rather conflicting scenario of periodontal status in the elderly Indian/Pakistani aged 65 years and over, who were found to have the best periodontal health compared with the other ethnic groups in the same age group and yet they were found to have the highest prevalence of deep periodontal pocket. And associated with this, the Indian/Pakistanis showed a rapid increase in the prevalence of deep pocket from 19.1 per cent for age group 55-64 to 33.3 per cent in the age group 65 years and over.
- ii. To verify the postulated reasons for the poorer periodontal health status in the Other Bumis compared with the other ethnic groups, such as lower socio-economic status, and inaccessibility to dental facilities, which have never been substantiated.

- iii. The reasons for the marked difference in the periodontal health status between the urban and the rural populations. A number of factors accounting for the differences have been postulated. These include the disparity of dental facilities between the urban and rural areas, difference in the income level, difference in the educational level, and the difference in attitudes towards dental health. How much does each of these reasons contribute towards the differences?
- iv. The difference in the dental health habits and attitudes towards oral health between males and females which could account for the noticeable difference in the periodontal health status between the two sexes.

5.6 CONCLUSION

The development of CPITN has contributed to a better understanding of the pattern of prevalence of periodontal diseases in many countries. CPITN data collected and stored in the WHO Global Oral Data Bank has enabled international comparisons to be made regarding the periodontal health status.

Some of the concerns about the reliability and validity of the index could be allayed if a more detailed recording system is adopted. The author suggests the use of a binary recording system which would record all periodontal conditions considered important in CPITN methodology (i.e. gingivitis, calculus, and periodontal pocket). In this system distinctions will be made between supra- and subgingival calculus, and between calculus associated with gingivitis and calculus without gingivitis. Pockets with calculus are differentiated from those which do not have calculus. The absence or presence of gingival bleeding (gingivitis) associated with periodontal pockets are also recorded.

No specific methodology for manpower calculation has been developed in association with the index. Attempts by some investigators to make use of the assessed treatment needs, obtained using the index, to calculate manpower requirement by applying treatment times estimates have been disappointing. This could be due to the fact that they calculated the

manpower requirement based on a one-to-one basis as opposed to a community approach which the index was supposed to be used for.

A specific methodology for manpower calculation is a very important aspect of CPITN which needs to be developed to ensure that the index is useful in manpower planning, and not only for assessing periodontal disease prevalence and their treatment needs. This methodology should be based on a public health concept rather than on a clinical concept using a one-to-one approach.

Periodontal disease has been found to be endemic in Malaysian adult populations but it does not seem to be a major public health problem as only 6 per cent of the them suffer from irreversible stages of the disease. Priority for periodontal treatment should be given to those aged 30-34 years since the rates of edentulousness and the development periodontal pocketings were observed to increase beginning at this age group. The treatment needs of the adolescents would continue to be catered for through the school dental services.

The use of dental therapists, who would be recruited from the existing dental nurses, to carry out periodontal examinations and scaling and polishing and to give chair-side oral hygiene instruction on adults, should be considered. Legislation to allow dental therapists to treat adolescents and adults above the age of 17 years should be incorporated. This is because

presently dental nurses could only treat children up to the age of 17 years with parental consent. The reason for recruiting dental therapists from the existing dental nurses are based on the following factors:

- i. There are more dental nurse than dentists in Malaysia, and all of them work in the government service.
- ii. The chances for dental nurses to be promoted in their posts are slim. The newly created post of dental therapist would be placed on a higher salary scale than that of dental nurse, and thus those nurses who are selected to be upgraded to become dental therapists could enhance their career prospect.

The results of the Dental Epidemiological Survey of Adults in Malaysia 1990-1991 have provided sufficient data for formulating Oral Health Goals for Malaysia in respect of periodontal diseases in the country. The author suggests the following goals for the year 2000:

Age (Yrs)	Goals
15-19	20 % with no periodontal problem with a mean number of 3.5 healthy sextants; and 60 % with CPITN 2
35-44	6 % edentulous
65 +	50 % edentulous; 12.5 mean number of teeth present.

These goals could be achieved by adopting specific strategies, including creating a new category of dental personnel for carrying out TN 1 and TN 2.

Some interesting features of the periodontal disease profiles in certain sectors of the adult populations may need to be investigated further by interested researchers in order to obtain a clearer insight into their causative factors.

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7 APPENDICES

APPENDIX 1

PREVALENCE OF PERIODONTAL DISEASE BY ETHNIC GROUP AND AGE GROUP

Source: Dental Epidemiological Survey of Adults in Malaysia 1990-1991

AGE GROUP	ETHNIC GROUP	NUMBER EXAMINED	NO. OF DENTATE PERSONS	% PERSONS CODED				
				H (0)	B (1)	C (2)	P1 (3)	P2 (4)
15-19	MALAY	846	846	16.5	9.2	70.7	3.1	0.5
	OTHER BUMI	367	367	10.9	4.6	77.7	6.5	0.3
	CHINESE	503	503	19.9	14.1	62.6	3.2	0.2
	INDIAN/PAK	183	183	25.1	17.5	53.5	3.8	0.0
	OTHERS	29	29	3.5	6.9	82.8	6.9	0.0
	ALL ETH.GPS.	1928	1928	16.9	10.4	68.5	3.9	0.3
20-24	MALAY	694	691	10.7	5.5	74.2	8.5	1.0
	OTHER BUMI	340	339	6.2	5.3	76.1	11.2	1.2
	CHINESE	356	352	11.4	13.9	67.0	6.8	0.8
	INDIAN/PAK	155	155	16.1	7.7	70.3	5.2	0.6
	OTHERS	52	52	0.0	1.9	86.5	11.5	0.0
	ALL ETH.GPS.	1597	1589	10.0	7.4	73.1	8.5	1.0
25-29	MALAY	825	818	6.5	4.9	72.9	13.8	1.9
	OTHER BUMI	321	317	4.4	1.9	70.0	21.1	2.5
	CHINESE	365	360	7.2	6.4	68.6	14.4	3.3
	INDIAN/PAK	175	175	8.6	8.6	71.4	8.6	2.9
	OTHERS	59	59	3.4	0.0	69.5	25.4	1.7
	ALL ETH.GPS.	1745	1729	6.4	4.8	71.3	15.1	2.4

N.B. H+B+C+P1+P2 =100%

APPENDIX 1 (Cont.)

PREVALENCE OF PERIODONTAL DISEASE BY ETHNIC GROUP AND AGE GROUP

Source: Dental Epidemiological Survey of Adults in Malaysia 1990-1991

AGE GROUP	ETHNIC GROUP	NUMBER EXAMINED	NO. OF DENTATE PERSONS	PERCENTAGE PERSONS CODED				
				H (0)	B (1)	C (2)	P1 (3)	P2 (4)
30-34	MALAY	824	803	6.2	4.5	69.5	14.8	5.0
	OTHER BUMI	324	320	3.7	0.3	69.7	22.8	3.4
	CHINESE	375	362	9.4	5.3	62.6	16.8	5.8
	INDIAN/PAK	169	168	7.1	5.9	75.6	10.1	1.3
	OTHERS	55	55	3.6	0.0	74.6	21.8	0.0
	ALL ETH.GPS.	1747	1708	6.4	3.9	68.9	16.5	4.3
35-44	MALAY	1260	1153	3.9	3.3	60.9	24.3	7.6
	OTHER BUMI	435	420	2.1	2.1	54.1	31.1	10.5
	CHINESE	670	505	7.4	3.1	64.6	16.4	8.4
	INDIAN/PAK	220	219	5.5	2.7	62.1	19.6	10.1
	OTHERS	59	55	1.8	0.0	52.7	36.4	9.1
	ALL ETH.GPS.	2644	2452	4.6	2.9	60.6	23.4	8.5
45-54	MALAY	904	706	1.6	0.4	60.2	26.1	11.8
	OTHER BUMI	330	300	1.7	0.0	42.7	39.7	16.0
	CHINESE	541	468	4.5	2.6	63.9	17.9	11.1
	INDIAN/PAK	121	116	1.7	0.9	49.1	27.6	20.5
	OTHERS	29	27	0.0	0.0	48.1	40.7	11.1
	ALL ETH.GPS.	1925	1617	2.4	0.9	57.1	26.5	13.0

N.B. H+B+C+P1+P2=100%

APPENDIX 1 (Cont.)

PREVALENCE OF PERIODONTAL DISEASE BY ETHNIC GROUP AND AGE GROUP

Source: Dental Epidemiological Survey of Adults in Malaysia 1990-1991

AGE GROUP	ETHNIC GROUP	NUMBER EXAMINED	NO. OF DENTATE PERSONS	% PERSONS CODED				
				H (0)	B (1)	C (2)	P1 (3)	P2 (4)
55-64	MALAY	638	408	2.2	0.7	58.8	26.9	11.3
	OTHER BUMI	242	186	1.6	1.1	46.2	34.4	16.7
	CHINESE	352	244	1.2	2.5	63.1	20.9	12.3
	INDIAN/PAK	98	84	1.2	7.1	50.0	22.6	19.1
	OTHERS	9	6	0.0	0.0	16.7	66.7	16.7
	ALL ETH.GPS.	1339	928	1.7	1.8	56.4	26.7	13.4
65+	MALAY	454	185	2.7	1.1	54.6	25.4	16.2
	OTHER BUMI	52	42	0.0	0.0	42.9	35.7	21.4
	CHINESE	255	90	7.8	0.0	64.4	18.9	8.9
	INDIAN/PAK	48	33	9.1	0.0	45.5	12.1	33.3
	OTHERS	6	4	0.0	0.0	25.0	75.0	0.0
	ALL ETH.GPS.	815	354	4.2	0.6	54.5	24.3	16.4
ALL AGE GROUP	MALAY	6445	5610	6.9	4.2	66.5	16.7	5.6
	OTHER BUMI	2411	2291	4.5	2.3	63.2	23.2	6.8
	CHINESE	3417	2984	9.3	6.7	64.6	13.5	6.0
	INDIAN/PAK	1169	1133	10.2	7.2	62.6	12.8	7.2
	OTHERS	298	287	2.1	1.1	67.9	25.4	3.5
	ALL ETH.GPS.	13740	12305	7.2	4.6	65.1	17.0	6.0

N.B. H+B+C+P1+P2=100%

APPENDIX 2

PREVALENCE OF PERIODONTAL DISEASE BY AGE GROUP AND GENDER

Source: Dental Epidemiological Survey of Adults in Malaysia 1990-1991

AGE GROUP	SEX	NUMBER EXAMINED	NO. OF DENTATE PERSONS	% PERSONS CODED				
				H (0)	B (1)	C (2)	P1 (3)	P2 (4)
15-19	MALE	836	836	16.9	9.8	69.7	3.4	0.2
	FEMALE	1092	1092	17.0	10.8	67.4	4.3	0.4
20-24	MALE	639	637	7.4	7.5	76.5	7.9	0.8
	FEMALE	958	952	11.9	7.4	70.8	8.9	1.1
25-29	MALE	691	690	5.5	5.4	69.1	17.1	2.9
	FEMALE	1054	1039	6.9	4.5	72.6	13.9	2.1
30-34	MALE	671	666	4.1	1.9	71.9	17.6	4.5
	FEMALE	1076	1042	7.9	5.1	66.9	15.8	4.2
35-44	MALE	1065	1030	3.6	2.5	57.4	25.7	10.8
	FEMALE	1579	1422	5.3	3.2	62.9	21.7	6.9
45-54	MALE	871	786	1.4	0.6	52.8	29.5	15.6
	FEMALE	1054	831	3.4	1.3	61.0	23.8	10.5
55-64	MALE	641	480	2.1	1.7	54.6	28.1	13.5
	FEMALE	698	448	1.3	2.0	58.3	25.2	13.2
65+	MALE	409	210	3.3	0.0	54.8	23.8	18.1
	FEMALE	406	144	5.6	1.4	54.2	25.0	13.9
ALL AGE GROUP	MALE	5823	5335	5.9	4.1	63.9	18.6	7.4
	FEMALE	7917	6970	8.2	5.1	66.0	15.7	4.9

APPENDIX 3

PREVALENCE OF PERIODONTAL DISEASE BY AGE GROUP AND URBAN/RURAL AREA

Source: Dental Epidemiological Survey Of Adults In Malaysia 1990-1991

AGE GROUP	URBAN/ RURAL	NUMBER EXAMINED	NO. OF DENTATE PERSONS	PERCENTAGE OF PERSONS WHO HAVE AS HIGHEST SCORE				
				H (0)	B (1)	C (2)	P1 (3)	P2 (4)
15-19	URBAN	771	771	20.2	15.6	61.2	2.9	0.1
	RURAL	1157	1157	14.7	7.0	73.3	4.6	0.4
20-24	URBAN	647	646	13.6	11.8	65.8	7.7	1.1
	RURAL	950	943	7.6	4.5	78.1	9.0	0.9
25-29	URBAN	633	629	8.4	9.5	65.7	15.1	1.3
	RURAL	1112	1100	5.2	2.2	77.4	15.2	3.1
30-34	URBAN	651	642	8.4	7.8	68.4	12.5	3.0
	RURAL	1096	1066	5.3	1.5	69.1	19.0	5.2
35-44	URBAN	976	926	6.1	5.4	64.2	18.7	5.7
	RURAL	1668	1526	3.7	1.4	58.4	26.2	10.2
45-54	URBAN	626	541	3.5	2.6	65.4	20.3	8.1
	RURAL	1299	1076	1.9	0.2	52.8	29.7	15.4
55-64	URBAN	413	300	3.0	4.0	62.3	21.3	9.3
	RURAL	926	628	1.1	0.8	53.5	29.3	15.3
65+	URBAN	247	97	5.2	1.0	64.9	18.6	10.3
	RURAL	568	257	3.9	0.4	50.6	26.5	18.7
ALL AGE GROUP	URBAN	4964	4552	9.7	8.4	64.7	13.4	3.7
	RURAL	8776	7753	5.8	2.5	65.3	19.1	7.3

APPENDIX 4

MEAN NUMBER OF AFFECTED SEXTANTS PER PERSON BY AGE GROUP

Source: Dental Epidemiological Survey of Adults in Malaysia 1990-1991

AGE GROUP	NO. OF DENTATE PERSONS	MEAN NO. OF SEXTANTS					
		NO PERIO. DISEASE (0)	BLEEDING OR HIGHER SCORE (1+2+3+4)	CALCULUS OR HIGHER SCORE (2+3+4)	SHALLOW POC. OR HIGHER SCORE (3+4)	DEEP POCKETS. (4)	EDENTULOUS < 2 TEETH (X)
15-19	1928	3.0	3.0	2.2	0.1	0.0	0.0
20-24	1589	2.2	3.7	3.0	0.2	0.0	0.1
25-29	1729	1.7	4.0	3.3	0.3	0.0	0.3
30-34	1708	1.4	4.0	3.5	0.4	0.0	0.6
35-44	2452	1.0	3.9	3.6	0.7	0.2	1.1
45-54	1617	0.5	3.9	3.6	0.9	0.2	1.6
55-64	928	0.3	3.4	3.2	0.8	0.2	2.3
65+	354	0.3	3.1	3.0	0.9	0.3	2.6
ALL AGE GROUP	12 305	1.5	3.7	3.2	0.5	0.1	0.8

APPENDIX 5

MEAN NUMBER OF AFFECTED SEXTANTS BY AGE GROUP AND ETHNIC GROUP
Source: Dental Epidemiological Survey of Adults in Malaysia 1990-1991

AGE GROUP	ETHNIC GROUP	NO. OF DENTATE PERSONS	MEAN NO. OF SEXTANTS					
			NO PERIO DISEASE (0)	BLEEDING OR HIGHER SCORE (1+2+3+4)	CALCULUS OR HIGHER SCORE (2+3+4)	SHALLOW POC OR HIGHER SCORE (3+4)	DEEP POCKETS (4)	EDENTULOUS < 2 TEETH (X)
15-19	MALAY	846	3.1	2.8	2.3	0.0	0.0	0.0
	OTHER BUMI	367	2.3	3.7	2.8	0.1	0.0	0.1
	CHINESE	503	3.2	2.7	1.8	0.1	0.0	0.0
	INDIAN/PAK	183	3.3	2.6	1.7	0.0	0.0	0.0
	OTHERS	29	1.4	4.6	3.9	0.1	0.0	0.1
20-24	MALAY	691	2.2	3.6	2.9	0.2	0.0	0.1
	OTHER BUMI	339	1.7	4.1	3.3	0.2	0.0	0.1
	CHINESE	352	2.5	3.5	2.5	0.1	0.0	0.1
	INDIAN/PAK	155	2.7	3.2	2.5	0.08	0.0	0.1
	OTHERS	52	0.9	4.8	4.0	0.1	0.0	0.2
25-29	MALAY	818	1.8	3.9	3.2	0.3	0.0	0.3
	OTHER BUMI	317	1.3	4.4	3.8	0.4	0.0	0.4
	CHINESE	360	1.8	3.8	3.1	0.4	0.1	0.4
	INDIAN/PAK	175	2.1	3.7	2.9	0.2	0.1	0.2
	OTHERS	59	0.6	4.7	4.3	0.5	0.0	0.7
30-34	MALAY	803	1.5	3.9	3.4	0.4	0.1	0.7
	OTHER BUMI	320	0.9	4.5	4.2	0.5	0.1	0.6
	CHINESE	362	1.4	3.8	3.2	0.4	0.1	0.8
	INDIAN/PAK	168	1.6	4.1	3.4	0.2	0.0	0.3
	OTHERS	55	0.8	4.6	4.2	0.3	0.0	0.7

APPENDIX 5 (Cont.)

MEAN NUMBER OF AFFECTED SEXTANTS BY AGE GROUP AND ETHNIC GROUP

Source: Dental Epidemiological Survey of Adults in Malaysia 1990-1991

AGE GROUP	ETHNIC GROUP	NO. OF DENTATE PERSONS	MEAN NO. OF SEXTANTS					EDENTULOUS < 2 TEETH (X)
			NO PERIO DISEASE (0)	BLEEDING OR HIGHER SCORE (1+2+3+4)	CALCULUS OR HIGHER SCORE (2+3+4)	SHALLOW POC. OR HIGHER SCORE (3+4)	DEEP POCKETS. (4)	
35-44	MALAY	1153	1.0	3.8	3.4	0.7	0.1	1.1
	OTHER BUMI	420	0.6	4.4	4.2	0.9	0.1	0.9
	CHINESE	605	1.1	3.7	3.3	0.5	0.1	1.3
	INDIAN/PAK	219	1.3	4.2	3.8	0.6	0.1	0.4
	OTHERS	55	0.4	4.5	4.4	0.9	0.1	0.9
45-54	MALAY	706	0.5	3.8	3.6	0.8	0.2	1.7
	OTHER BUMI	300	0.3	4.4	4.3	1.3	0.2	1.2
	CHINESE	468	0.7	3.4	3.1	0.6	0.2	1.8
	INDIAN/PAK	116	0.8	4.4	4.1	1.2	0.5	0.8
	OTHERS	27	0.3	4.4	4.3	0.9	0.1	1.3
55-64	MALAY	408	0.3	3.2	3.0	0.7	0.2	2.5
	OTHER BUMI	186	0.3	3.6	3.5	1.1	0.3	2.1
	CHINESE	244	0.3	3.4	3.1	0.7	0.2	2.3
	INDIAN/PAK	84	0.7	4.1	3.3	1.0	0.4	1.3
	OTHERS	6	0.2	3.0	3.0	1.7	0.7	2.8
65+	MALAY	185	0.2	2.9	2.8	0.8	0.3	2.9
	OTHER BUMI	42	0.0	3.9	3.8	1.3	0.3	2.0
	CHINESE	90	0.5	2.8	2.7	0.5	0.2	2.7
	INDIAN/PAK	33	0.5	3.8	3.5	1.4	0.9	1.7
	OTHERS	4	0.0	3.3	3.3	2.5	0.0	2.7
ALL AGE GROUP	MALAY	5610	1.5	3.6	3.1	0.4	0.1	0.9
	OTHER BUMI	2291	1.1	4.2	3.7	0.6	0.1	0.7
	CHINESE	2984	1.6	3.4	2.8	0.4	0.1	1.0
	INDIAN/PAK	1133	1.9	3.7	3.1	0.4	0.2	0.4
	OTHERS	287	0.7	4.6	4.2	0.5	0.1	0.7

APPENDIX 6

MEAN NUMBER OF AFFECTED SEXTANTS BY AGE GROUP AND URBAN/RURAL AREA

Source: Dental Epidemiological Survey of Adults in Malaysia 1990-1991

AGE GROUP	URBAN/RURAL	NO. OF DENTATE PERSONS	MEAN NO. OF SEXTANTS					
			NO PERIODIC DISEASE (0)	BLEEDING OR HIGHER SCORE (1+2+3+4)	CALCULUS OR HIGHER SCORE (2+3+4)	SHALLOW POC. OR HIGHER SCORE (3+4)	DEEP POCKETS (4)	EDENTULOUS < 2 TEETH (X)
15-19	URBAN	771	3.2	2.8	1.8	0.1	0.0	0.0
	RURAL	1157	2.8	3.1	2.5	0.1	0.0	0.0
20-24	URBAN	646	2.4	3.5	2.5	0.1	0.0	0.1
	RURAL	943	2.1	3.8	3.2	0.2	0.0	0.1
25-29	URBAN	629	1.9	3.8	2.9	0.3	0.0	0.2
	RURAL	1100	1.6	4.0	3.6	0.4	0.1	0.4
30-34	URBAN	642	1.7	3.8	2.9	0.3	0.1	0.6
	RURAL	1066	1.2	4.1	3.9	0.5	0.1	0.7
35-44	URBAN	926	1.3	3.8	3.1	0.5	0.1	1.0
	RURAL	1526	0.8	4.1	3.8	0.8	0.2	1.1
45-54	URBAN	541	0.8	3.6	3.2	0.6	0.2	1.7
	RURAL	1076	0.4	4.0	3.8	1.0	0.3	1.6
55-64	URBAN	300	0.5	3.4	3.0	0.5	0.1	2.1
	RURAL	628	0.3	3.4	3.3	0.9	0.3	2.4
65+	URBAN	97	0.4	3.1	3.0	0.6	0.2	2.5
	RURAL	257	0.2	3.1	3.0	1.0	0.4	2.7
ALL AGE GROUPS	URBAN	4552	1.8	3.5	2.8	0.3	0.1	0.7
	RURAL	7753	1.3	3.8	3.4	0.6	0.1	0.9

APPENDIX 7

MEAN NUMBER OF AFFECTED SEXTANTS BY AGE GROUP AND GENDER

Source: Dental Epidemiological Survey of Adults in Malaysia 1990-1991

AGE GROUP	SEX	NO. OF DENTATE PERSONS	MEAN NO. OF SEXTANTS					
			NO PERIO. DISEASE (0)	BLEEDING OR HIGHER SCORE (1+2+3+4)	CALCULUS OR HIGHER SCORE (2+3+4)	SHALLOW POC. OR HIGHER SCORE (3+4)	DEEP POCKETS. (4)	EDENTULOUS < 2 TEETH (X)
15-19	MALE	836	2.9	3.0	2.3	0.1	0.0	0.0
	FEMALE	1092	2.9	2.9	2.1	0.1	0.0	0.0
20-24	MALE	637	1.9	3.9	3.2	0.1	0.0	0.1
	FEMALE	952	2.4	3.5	2.8	0.1	0.0	0.1
25-29	MALE	690	1.5	4.3	3.6	0.4	0.1	0.2
	FEMALE	1039	1.8	3.7	3.1	0.3	0.0	0.4
30-34	MALE	666	1.2	4.4	3.9	0.4	0.1	0.4
	FEMALE	1042	1.4	3.8	3.3	0.4	0.1	0.8
35-44	MALE	1030	1.0	4.3	3.9	0.8	0.1	0.7
	FEMALE	1422	0.9	3.7	3.3	0.6	0.1	1.3
45-54	MALE	786	0.5	4.2	3.9	1.0	0.3	1.2
	FEMALE	831	0.6	3.5	3.3	0.7	0.2	1.9
55-64	MALE	480	0.4	3.6	3.3	0.8	0.2	2.1
	FEMALE	448	0.3	3.2	3.0	0.7	0.2	2.5
65+	MALE	210	0.3	3.2	3.1	0.9	0.3	2.6
	FEMALE	144	0.3	2.9	2.8	0.7	0.3	2.8
ALL AGE GROUPS	MALE	5335	1.4	3.9	3.5	0.6	0.1	0.7
	FEMALE	6970	1.6	3.5	2.9	0.4	0.1	0.9

APPENDIX 8

TREATMENT NEEDS FOR PERIODONTAL DISEASE BY AGE GROUP
Source: Dental Epidemiological Survey of Adults in Malaysia 1990-1991

AGE GROUP	NO. OF DENTATE PERSONS	TREATMENT NEED			
		% TN 0	% TN 1	% TN 2 (MEAN NO. OF SEXTANTS)	% TN 3 (MEAN NO. OF SEXTANTS)
15-19	1928	16.9	83.1	72.7 (2.2)	0.3 (0.0)
20-24	1589	10.0	90.0	82.6 (3.0)	0.9 (0.0)
25-29	1729	6.4	93.6	88.4 (3.3)	2.4 (0.0)
30-34	1708	6.4	93.6	89.7 (3.5)	4.3 (0.0)
35-44	2452	4.6	95.4	92.5 (3.6)	8.5 (0.2)
45-54	1617	2.4	97.6	96.6 (3.6)	13.0 (0.2)
55-64	928	1.7	98.3	96.5 (3.2)	13.4 (0.2)
65+	354	4.2	95.8	95.2 (3.0)	16.4 (0.3)
ALL AGE GROUP	12 305	7.2	92.8	88.1 (3.2)	6.0 (0.1)

APPENDIX 9

TREATMENT NEEDS FOR PERIODONTAL DISEASE BY AGE GROUP AND ETHNIC GROUP

Source: Dental Epidemiological Survey of Adults in Malaysia 1990-1991

AGE GROUP	ETHNIC GROUP	NO. OF DENTATE PERSONS	TREATMENT NEED			
			% TN 0	% TN 1	% TN 2 (MEAN NO. OF SEXTANTS)	% TN 3 (MEAN NO. OF SEXTANTS)
15-19	MALAY	846	16.6	83.5	74.2(2.3)	0.5(0.0)
	OTHER BUMI	367	10.9	89.1	84.5(2.8)	0.3(0.0)
	CHINESE	503	19.9	80.1	66.0(1.8)	0.2(0.0)
	INDIAN/PAK	183	25.1	74.9	57.4(1.7)	0.0(0.0)
	OTHERS	29	3.5	96.5	89.7(3.9)	0.0(0.0)
20-24	MALAY	691	10.7	89.3	83.8(2.9)	1.0(0.0)
	OTHER BUMI	339	6.2	93.8	88.5(3.3)	1.2(0.0)
	CHINESE	352	11.4	88.6	74.7(2.5)	0.9(0.0)
	INDIAN/PAK	155	16.1	83.9	76.1(2.5)	0.7(0.0)
	OTHERS	52	0.0	100.0	98.1(4.0)	0.0(0.0)
25-29	MALAY	818	6.5	93.5	88.6(3.2)	1.9(0.0)
	OTHER BUMI	317	4.4	95.6	93.7(3.8)	2.5(0.0)
	CHINESE	360	7.2	92.8	86.4(3.1)	3.3(0.1)
	INDIAN/PAK	175	8.6	91.4	82.9(2.9)	2.9(0.1)
	OTHERS	59	3.4	96.6	96.6(4.3)	1.7(0.0)

APPENDIX 9 (Cont.)

TREATMENT NEEDS FOR PERIODONTAL DISEASE BY AGE GROUP AND ETHNIC GROUP

Source: Dental Epidemiological Survey of Adults in Malaysia 1990-1991

AGE GROUP	ETHNIC GROUP	NO. OF DENTATE PERSONS	TREATMENT NEED			
			% TN 0	% TN 1	% TN 2 (MEAN NO. OF SEXTANTS)	% TN 3 (MEAN NO. OF SEXTANTS)
30-34	MALAY	803	6.2	93.8	89.3(3.4)	5.0(0.1)
	OTHER BUMI	320	3.8	96.3	95.9(4.2)	3.4(0.1)
	CHINESE	362	9.4	90.6	85.4(3.2)	5.8(0.1)
	INDIAN/PAK	168	7.2	92.9	86.9(3.4)	1.2(0.0)
	OTHERS	55	3.6	96.4	96.4(4.2)	0.0(0.0)
35-44	MALAY	1153	3.9	96.0	92.7(3.4)	7.6(0.1)
	OTHER BUMI	420	2.1	97.9	95.7(4.2)	10.5(0.1)
	CHINESE	605	7.4	92.6	89.4(3.3)	8.4(0.1)
	INDIAN/PAK	219	5.5	94.5	91.8(3.8)	10.1(0.2)
	OTHERS	55	1.8	98.2	98.2(4.4)	9.1(0.2)
45-54	MALAY	706	1.6	98.4	98.0(3.6)	11.8(0.2)
	OTHER BUMI	300	1.7	98.3	98.3(4.3)	16.0(0.2)
	CHINESE	468	4.5	95.5	92.9(3.1)	11.1(0.2)
	INDIAN/PAK	116	1.7	98.3	97.4(4.1)	20.7(0.5)
	OTHERS	27	0.0	100.0	100.0(4.3)	11.1(0.1)

APPENDIX 9 (Cont.)

TREATMENT NEEDS FOR PERIODONTAL DISEASE BY AGE GROUP
AND ETHNIC GROUP

Source: Dental Epidemiological Survey of Adults in Malaysia 1990-1991

AGE GROUP	ETHNIC GROUP	NO. OF DENTATE PERSONS	TREATMENT NEED			
			% TN 0	% TN 1	% TN 2 (MEAN NO. OF SEXTANTS)	% TN 3 (MEAN NO. OF SEXTANTS)
55-64	MALAY	408	2.2	97.8	97.1(3.0)	11.3(0.2)
	OTHER BUMI	186	1.6	98.4	97.3(3.5)	16.7(0.3)
	CHINESE	244	1.2	98.7	96.3(3.1)	12.3(0.2)
	INDIAN/PAK	84	1.2	98.8	91.7(3.3)	19.1(0.4)
	OTHERS	6	0.0	100.0	100.0(3.0)	16.7(0.7)
65+	MALAY	185	2.7	97.3	96.2(2.8)	16.2(0.3)
	OTHER BUMI	42	0.0	100.0	100.0(3.8)	21.4(0.3)
	CHINESE	90	7.8	92.2	92.2(2.7)	8.9(0.2)
	INDIAN/PAK	33	9.1	90.9	90.9(3.5)	33.3(0.9)
	OTHERS	4	0.0	100.0	100.0(3.3)	0.0(0.0)
ALL AGE GROUPS	MALAY	5610	6.9	93.1	88.8(3.1)	5.6(0.1)
	OTHER BUMI	2291	4.5	95.5	93.2(3.7)	6.8(0.1)
	CHINESE	2984	9.3	90.8	84.1(2.8)	6.0(0.1)
	INDIAN/PAK	1133	10.2	89.8	82.5(3.1)	7.2(0.2)
	OTHERS	287	1.7	97.9	96.9(4.2)	3.5(0.1)

APPENDIX 10

TREATMENT NEEDS FOR PERIODONTAL DISEASE BY AGE GROUP AND GENDER

Source: Dental Epidemiological Survey of Adults in Malaysia 1990-1991

AGE GROUP	SEX	NO. OF DENTATE PERSONS	TREATMENT NEED			
			% TN 0	% TN 1	% TN 2 (MEAN NO. OF SEXTANTS)	% TN 3 (MEAN NO. OF SEXTANTS)
15-19	MALE	836	16.9	83.1	73.3(2.3)	0.2(0.0)
	FEMALE	1092	17.0	82.9	72.2(2.1)	0.4(0.0)
20-24	MALE	637	7.4	92.6	85.1(3.2)	0.8(0.0)
	FEMALE	952	11.9	88.1	80.8(2.8)	1.1(0.0)
25-29	MALE	690	5.5	94.5	89.1(3.6)	2.9(0.1)
	FEMALE	1039	6.9	93.1	88.5(3.1)	2.1(0.0)
30-34	MALE	666	4.1	95.9	93.9(3.9)	4.5(0.1)
	FEMALE	1042	7.9	92.0	86.9(3.3)	4.2(0.1)
35-44	MALE	1030	3.6	96.4	93.9(3.9)	10.8(0.1)
	FEMALE	1422	5.3	94.7	91.4(3.3)	6.9(0.1)
45-54	MALE	786	1.4	98.6	97.9(3.9)	15.6(0.3)
	FEMALE	831	3.4	96.6	95.3(3.3)	10.5(0.2)
55-64	MALE	480	2.1	97.9	96.3(3.3)	13.5(0.2)
	FEMALE	448	1.3	98.7	96.6(3.0)	13.2(0.3)
65+	MALE	210	3.3	96.8	96.7(3.1)	18.1(0.3)
	FEMALE	144	5.7	94.4	93.1(2.7)	13.9(0.3)
ALL AGE GROUP	MALE	5335	6.0	94.0	89.9(3.5)	7.4(0.1)
	FEMALE	6970	8.2	91.8	86.7(3.0)	4.9(0.1)

APPENDIX 11

TREATMENT NEEDS FOR PERIODONTAL DISEASE BY AGE GROUP AND URBAN/RURAL AREA
Source: Dental Epidemiological Survey of Adults in Malaysia 1990-1991

AGE GROUP	URBAN/ RURAL	NO. OF DENTATE PERSONS	TREATMENT NEED			
			% TN 0	% TN 1	% TN 2 (MEAN NO. OF SEXTANTS)	% TN 3 (MEAN NO. OF SEXTANTS)
15-19	URBAN	771	20.2	79.8	64.2(1.8)	0.1(0.0)
	RURAL	1157	14.8	85.2	78.3(2.5)	0.4(0.0)
20-24	URBAN	646	13.6	86.4	74.6(2.5)	1.1(0.0)
	RURAL	943	7.6	92.4	87.9(3.2)	0.9(0.0)
25-29	URBAN	629	8.4	91.6	82.0(2.9)	1.3(0.0)
	RURAL	1100	5.2	94.8	92.6(3.6)	3.1(0.1)
30-34	URBAN	642	8.4	91.6	83.8(2.9)	2.9(0.1)
	RURAL	1066	5.3	94.8	92.3(3.9)	5.2(0.1)
35-44	URBAN	926	6.1	94.0	88.6(3.1)	5.7(0.1)
	RURAL	1526	3.7	96.3	94.8(3.8)	10.2(0.2)
45-54	URBAN	541	3.5	96.5	93.9(3.2)	8.1(0.2)
	RURAL	1076	1.9	98.1	97.9(3.8)	15.4(0.3)
55-64	URBAN	300	3.0	97.0	93.0(2.9)	9.3(0.1)
	RURAL	628	1.1	98.9	98.1(3.3)	15.3(0.3)
65+	URBAN	97	5.2	94.9	93.8(2.9)	10.5(0.2)
	RURAL	257	3.9	96.1	95.7(2.9)	18.7(0.4)
ALL AGE GROUPS	URBAN	4552	9.7	90.3	81.9(2.8)	3.7(0.1)
	RURAL	7753	5.8	94.2	91.7(3.4)	7.3(0.1)

APPENDIX 12

Times required for periodontal treatment procedures based on sextant times (modified from the WHO TRS 621 recommendations) for age group 15-19 years.

Source: Adapted from Manji and Sheiham (1985).

Treatment category	Treatment	Time required
TN 1	OHI	60 min/person
TN 2	Initial	
	Scaling	6.7 min/sextant
	OHI	50 min/person
	Follow-up	
TN 3	Scaling	3.3 min/sextant
	OHI	10 min/person
	Initial	
	Scaling	30 min/person
	Surgery	40 min/sextant
	OHI	50 min/person
	Postop care	30 min/person
	Follow-up	
	Scaling	6.7 min/sextant
	OHI	10 min/person

APPENDIX 13

Calculations of Treatment Times for the Different Treatment Procedures Based on the Sextant Times Estimates in Appendix 12 for Adolescents Aged 15-19 Years in Malaysia.

Estimated Population=1 838 500 (1990)

Treatment Category	Procedure	No. of Persons	No. of Sextants	No. of Working Days
TN 1	OHI	1 537 793		192 224
TN 2	Initial			
	Scaling	133 408	2 935 698	40 977
	OHI			13 897
	Follow-up			
	Scaling	133 408	2 935 689	20 183
	OHI			2 779
TN 3	Nil			
Total				270 060
Equivalent in years				1 228

Note: No. of Persons = % of Persons Affected x Estimated Population
No. of Sextants = MNS x No. of Persons

APPENDIX 14

Times required for periodontal treatment procedures based on sextant times (modified from the WHO TRS 621 recommendations) for age group 20-29 years.

Treatment category	Treatment	Time required
TN 1	OHI	60 min/person
TN 2	Initial	
	Scaling	10 min/sextant
	OHI	50 min/person
TN 3	Follow-up	
	Scaling	3.3 min/sextant
	OHI	10 min/person
	Initial	
	Scaling	30 min/sextant
	Surgery	40 min/sextant
	OHI	50 min/person
	Postop care	30 min/person
	Follow-up	
	Scaling	6.7 min/sextant
	OHI	10 min/person

APPENDIX 15

Calculations of Treatment Times for the Different Treatment Procedures Based on the Sextant Times Estimates in Appendix 14 for Adults Aged 20-24 Years in Malaysia.

Estimated Population = 1 679 500 (1990)

Treatment Category	Procedure	No. of Persons	No. of Sextants	No. of Working Days
TN 1	OHI	1 511 550		188 944
TN 2	Initial			
	Scaling	1 387 267	4 161 801	86 704
	OHI			144 507
	Follow-up			
	Scaling	1 387 267	4 161 801	28 612
	OHI			28 901
TN 3	Nil			
Total				477 668
Equivalent in years				2 171

APPENDIX 16

Calculations of Treatment Times for the Different Treatment Procedures Based on the Sextant Times Estimates in Appendix 14 for Adults Aged 25-29 Years in Malaysia.

Estimated Population = 1 559 600 (1990)

Treatmenmt Category	Procedure	No. of Persons	No. of Sextants	No. of Working Days
TN 1	OHI	1 459 786		182 473
TN 2	Initial			
	Scaling	1 378 686	4 549 664	94 785
	OHI			143 613
	Follow-up			
	Scaling	1 378 686	4 549 664	31 279
	OHI			28 723
TN 3	Nil			
Total				480 873
Equivalent in years				2 185

Times required for periodontal treatment procedures based on sextant times (modified from the WHO TRS 621 recommendations) for age group 30-44 years.

Treatment category	Treatment	Time required
TN 1	OHI	10 min/person
TN 2	Initial	
	Scaling	20 min/sextant
	OHI	50 min/person
	Follow-up	
TN 3	Scaling	3.3 min/sextant
	OHI	10 min/person
	Initial	
	Scaling	30 min/sextant
	Surgery	40 min/sextant
	OHI	50 min/person
	Postop care	30 min/person
	Follow-up	
	Scaling	6.7 min/sextant
	OHI	10 min/person

APPENDIX 18

Calculations of Treatment Times for the Different Treatment Procedures Based on the Sextant Times Estimates in Appendix 17 for Adults Aged 30-34 Years in Malaysia.

Estimated Population = 1 335 100 (1990)

Treatment Category	Procedure	No. of Persons	No. of Sextants	No. of Working Days
TN 1	OHI	1 249 654		26 034
TN 2	Initial			
	Scaling	1 197 585	4 191 547	174 648
	OHI			124 748
	Follow-up			
	Scaling	1 197 585	4 191 547	28 817
	OHI			24 950
TN 3	Nil			
Total				379 197
Equivalent in years				1 724

APPENDIX 19

Calculations of Treatment Times for the Different Treatment Procedures Based on the Sextant Times Estimates in Appendix 17 for Adults Aged 35-44 Years in Malaysia.

Estimated Population = 1 992 400 (1990)

Treatment Category	Procedure	No. of Persons	No. of Sextants	No. of Working Days
TN 1	OHI	1 900 750		39 599
TN 2	Initial			
	Scaling	1 842 970	6 634 692	276 455
	OHI			191 976
	Follow-up			
	Scaling	1 842 970	6 634 692	45 614
	OHI			38 395
TN 3	Initial			
	Scaling	169 354	33 871	2 117
	Surgery			2 823
	OHI			17 641
	Postop Care			10 585
	Follow-up			
	Scaling	169 354	33 871	473
	OHI			3 528
Total				629 206
Equivalent in years				2 860

APPENDIX 20

Times required for periodontal treatment procedures based on sextant times (modified from the WHO TRS 621 recommendations) for age group 45 years and over.

Treatment category	Treatment	Time required
TN 1	OHI	10 min/person
TN 2	Initial	
	Scaling	20 min/sextant
	OHI	50 min/person
	Follow-up	
	Scaling	3.3 min/sextant
TN 3	OHI	10 min/person
	Initial	
	Scaling	30 min/sextant
	Surgery	40 min/sextant
	OHI	50 min/person
	Postop care	30 min/person
	Follow-up	
	Scaling	6.7 min/sextant
	OHI	10 min/person

APPENDIX 21

Calculations of Treatment Times for the Different Treatment Procedures Based on the Sextant Times Estimates in Appendix 20 for Adults Aged 45-54 Years in Malaysia.

Estimated Population = 1 289 800 (1990)

Treatment Category	Procedure	No. of Persons	No. of Sextants	No. of Working Days
TN 1	OHI	1 258 845		26 226
TN 2	Initial			
	Scaling	1 245 947	4 485 409	186 892
	OHI			129 786
	Follow-up			
	Scaling	1 245 947	4 485 409	30 837
	OHI			25 957
TN 3	Initial			
	Scaling	167 674	33 535	20 848
	Surgery			2 795
	OHI			17 466
	Potsop Care			10 480
	Follow-up			
	Scaling	167 674	33 535	468
	OHI			3 493
Total				455 246
Equivalent in years				2 069

APPENDIX 22

Calculations of Treatment Times for the Different Treatment Procedures Based on the Sextant Times Estimates in Appendix 20 for Adults Aged 55-64 Years in Malaysia.

Estimated Population = 825 400 (1990)

Treatment Category	Procedure	No. of Persons	No.of Sextants	No. of Working Days
TN 1	OHI	811 368		16 903
TN 2	Initial			
	Scaling	796 511	2 548 835	106 201
	OHI			82 970
	Follow-up			
	Scaling	796 511	2 548 835	17 523
	OHI			16 594
TN 3	Initial			
	Scaling	110 604	22 121	1 383
	Surgery			1 843
	OHI			11 521
	Postop Care			6 913
	Follow-up			
	Scaling	110 604	22 121	309
	OHI			2 304
Total				264 464
Equivalent in years				1 202

APPENDIX 23

Calculations of Treatment Times for the Different Treatment Procedures Based on the Sextant Time Estimates in Appendix 20 for Old Age Cohorts Aged 65 Years and Over in Malaysia.

Estimated Population = 700 600 (1990)

Treatment Category	Procedure	No. of Persons	No. of Sextants	No. of Working Days
TN 1	OHI	671 175		13 983
TN 2	Initial			
	Scaling	666 971	200 913	8 371
	OHI			69 476
	Follow-up			
	Scaling	666 971	200 913	1381
	OHI			13 895
TN 3	Initial			
	Scaling	114 898	34 469	2 154
	Surgery			2 872
	OHI			11 969
	Postop Care			7 181
	Follow-up			
	Scaling	114 898	34 469	481
	OHI			2 394
Total				134 157
Equivalent in years				610

APPENDIX 24

Time required for periodontal treatment procedures based on sextant times (modified from the WHO TRS 621 recommendations) for adults in Malaysia aged 15 years and above.

Total population = 11 221 100 (1990)

Age Group (Years)	Estimated Population	Equiv. No. of Working Years			
		TN1	TN2	TN3	Total
15 - 19	1 838 500	874	354	-	1 228
20 - 24	1 679 500	859	1 312	-	2 171
25 - 29	1 559 600	829	1 356	-	2 185
30 - 34	1 335 100	118	1 606	-	1 724
35 - 44	1 992 400	180	2 511	169	2 860
45 - 54	1 289 800	119	1 698	252	2 069
55 - 64	825 400	77	1 015	110	1 202
65+	700 600	64	423	123	610
Total	11 221 100	3 120	10 275	654	14 049