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EDITORIAL

For the attainment of the goal of health for all the members of the community, the only promise is a sound practice of preventive medicine. This is however, strongly conditioned with the awareness of not only those who are responsible for planning and administering health services but of the recipients and technologists also. Furthermore, there are many deficiencies which hinder the proper and efficient practice of public health, for which research on applied aspects is needed. To publish the results of the research and to promote the cause of Public Health, some sort of publication is needed. Publication of Pakistan Journal of Health by College of Community Medicine, Lahore is desired to meet these objectives.

Prof. Dr. Shamim Raza Bokhari,
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ORAL BACTERIOLOGICAL FINDINGS – TESTING THE SENSITIVITY AND RESISTANCE OF BACTERIA TO ANTIMICROBIL AGENTS

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Abstract

Micro-biological investigations were carried out on oral infective diseases, reporting to Department of Dental Public Health Research Unit, College of Community Medicine, Lahore. The study is based on total sample of 650 cases. The range of the age was 20 to 40 years belonging to well-to-do socio-economic class, study included 344 male, 316 female, from November 1974 to November 1979.

Bacteriologically positive cases of periodontal disease had the following distribution of the micro-organisms. Pus cells were found only in 38% of cases, Gram positive Cocci 95, 44.61%, Gram negative Cocci in 2.61%, Fusiform bacilli and Spirochaetes were detected in 30.30% cases respectively.

Culture reports revealed:—

Staphylococcus Pyogenes, 55.00%; Non-haemolytic streptococci, 17.68%, Haemolytic streptococci, 7.38%, Alpha haemolytic streptococci 4.76%, Beta haemolytic streptococci

3.07%; Streptococcus viridans, 1.23%; Streptococcus pneumoniae, 0.30%; Escherichia coli, 9.69%; Pseudomonas aeruginosa, 0.15% Klebsiella pneumoniae, 0.46%; Proteus vulgaris, 0.61%, and Haemophilus influenza, 0.61%.

The sensitivity and resistance reports have shown very interesting results. Pencillin is being observed as the most resistant drug to oral bacteria, whereas Chloramphenicol has proved to be excellent sensitive for positive cases. The other antibiotics have also indicated their trend of resistance. The study has been further split up to each bacteria and its sensitivity and resistance to each antibiotic. Similar resistance has been observed in Tetracycline group.

The utility of this study is of great importance for those who seek help of anti-biotics in their practice.

Introduction

Periodontal disease continues to be universal in its distribution all over the world. Even earliest man had

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experience of its suffering. Carranza (1978) opined that periodontal disease does not lend itself easily to objective measurement, because the signs of periodontal pathology involves colour changes in the soft tissues, swelling, bleeding and bone changes, which are reflected in sulcus depth, changes or Pathologic Pocket formation and loss of tooth function is due to mobility.

So the study of disease needs further investigation like microscopic bacteriological tests and radiographic aid, to establish the disease in order to get better understanding, process for finding a method of control, prevention and treatment. Koch (1800) postulates that there is specific bacterial agent to cause a disease. Socranstksy (1977) observed that organism or group of organisms may be responsible for causing damage to periodontal tissues. The bulk of this research has been for finding out causative pathogen and their treatment. Saviston et. al (1972) have observed bacterial etiology for periodontal disease.

In Pakistan, the incidence of periodontal disease is enormously high, according to studies carried out by Soofi et. al. at Quetta (1962), Punjab (1978), and in N.W.F.P. (1979), and study by Day et. al. (1947), Ramfjord (1963), examined Indian School of Children at Bombay and found 100% periodontal disease. Similar results are

available by the studies carried out by W.H.O. elsewhere and other workers in the world. So in this study we have limited ourselves to the infection of periodontal disease to evaluate the causation and sensitivity to broad-spectrum antibiotics.

Objective

The oral flora consist of a diverse collection of bacterial and protozoal species existing in different parts of mouth. Among the organisms, we have limited our study, for those, which are associated with periodontal disease, in trying to determine the reason for delicate organisms and to know their sensitivity and resistance to broad spectrum antibiotics.

Most of antimicrobial drugs are antibiotics—and due to their common use, they are developing drug Resistance in bacteria. Even broad spectrum antibiotics have developed resistance, this may be due to characteristics structure in bacteria, the cell wall, which is quite different from high organisms. It is just the inhibition of bacterial cell wall synthesis (e.g. Pencillin and bacitracin) as chloramphenicol is active by inhibiting the protein synthesis and this has not developed higher resistance and we have the way open for future studies, how and why resistance is developing?

Material and Methods

All suspected cases 650 of periodontal disease reporting to the Depart-

ment of Dental Public Health Research Cell, College of Community Medicine are included in this study. The investigation started at the end of November, 1974 to December 1979. The selection was made according to the clinical-judgement, patient's history, present symptoms or history of treatment carried before. However, complete history of each case was recorded on a prepared proforma. The cases were examined in a standard light of the dental unit and in a sitting position. Pus exudate specimen of 650 cases was taken in a sterile test tube and sent over to the Medical Laboratory for direct examination, culture and drug sensitivity test. In certain advanced cases the purulent exudate was expressed from 'periodontal pocket by digital pressure, mostly exudate was taken with the help of curette. for transferring to the laboratory in test tube.

In many cases the pocket was considered pathological due to "deepened gingival sulcus because the depth was larger than the normal gingival sulcus". This detection was made through the help of Dental Radiographs and clinically detection was made with the help of a blunt prob. In addition, an isolated rectangular linear zone of gingival was noted and gingival mucosa extending for a variable distance was observed. It was also reddish blue in colour, with glistening surface, enlarged, puffy and discolored margins. Elongation and wandering of teeth were

also noted. Pain in certain cases was observed during the pressure or with the food.

Diffusion Tests with filter paper disks was used to determine the sensitivity to antibiotics, because of the simplicity and reliable technique for such heavy routine type of bacteriological work. Impregnated small disks of standard filter paper with known amounts of antibiotic were placed on the plates of culture medium inoculated with oral organisms. After incubation at 37°C for over a night, degree of sensitivity was measured by visible area of inhibition of growth produced by diffusion of antibiotic from the disks into surrounding medium. Commonly the disks are 6.25 m.m. in diameter. After over night incubation, the diameter of zones of inhibition were measured and sensitivity was obtained for each antibiotic. The areas of inhibition measured, included that of disks or were as surrounding zone on blood agar plates, which are inoculated uniformly with both culture. Resistance was recognized as lack of an inhibition zone whereas the zone of inhibition in sensitive cultures were read as radius of inhibition expressed in m.ms. The pus samples were cultured on Blood agar plates aerobically for overnight. Drug sensitivity test for antibiotics was performed by the Gould and Bowie

(1952) disks method.

The disks for Penicillin, Streptomycin, Chloramphenicol, Tetracycline, Erythromycin, Ceporan, Furadantin, Vibramycin, Pyopen, Polymyxin B, Kanamycin, Albamycin, Ampicillin, Cloxacillin, Lincocin, Cycloserin, Co-Trimoxazole and Genticycyn were used. Disks containing antibiotics and other chemotherapeutics agents. Penicillin 50 Units, Ampicillin 50 ug, Cloxacillin 10 ug, Streptomycin 50 ug, Kenamycin 50 ug, Chloramphenicol 25 ug, Tetracycline 25 ug, Erythromycin 10 ug, Carbenicillin 10 ug, Ampicillin 10 ug, Sulphonamide 250 ug, Septran 25 ug.

In this study the range of age was 20 to 40 years, belonging to well-to-do socio-economic class. The study included 650 cases in which 344 were males and 316 were females. Most of the cases had the chronic periodontal disease. The study did not include typical cases of candidiasis, lichen planus, leukoplakia and acute cases of ulcerative gingivitis and no epidemiological findings are included here. No histopathology examination of the periodontal pocket or disease was carried out. The study is limited only to the bacteriological involvement of the area.

The study (1974-79) has proved

oral bacteria in Table No. 1 are causative factors for periodontal disease and there is trend of antibiotic getting ineffective. Test of sensitivity for antibiotics may be administered unless a report from a reasonable competent laboratory is received and proper investigations are carried out to identify bacteria.

PROCEDURE OF INOCULATION

The swab stick was inoculated onto blood agar, heated blood agar (chocolate agar) and MacConkey's medium. A liquid broth specimen was also inoculated. Smears were prepared. These media were incubated at 37°C for 18 to 24 hours. The nature of colonies was examined on the solid medium and sub cultures made from liquid medium on to solid media for further identification of bacteria. The pathogens were selected for antibiotic sensitivity by disk diffusion method on blood agar. These were again incubated for 18 hours at 37°C and zones of inhibition measured and compared with control organism after which sensitivity or resistance of a pathogen to an antibiotic was reported.

The smears were stained by Grams stain and examined for presence of pus cells, fusiform bacilli and *Borellia vincentii*.

RESULTS

A STUDY OF ORAL BACTERIOLOGICAL SPECIMENS

(NOVEMBER 1974 – NOVEMBER 1979)

TABLE NO. 1
PERCENTAGE DISTRIBUTION OF 650 CASES

DIRECT SMEARS RESULTS	TOTAL	SEX DISTRIBUTION	
		Male	Female
Gram Positive Cocci	44.61%	23.84%	20.77%
Gram Negative Cocci	2.61%	1.69%	0.92%
Fusiformis Spirochaetes	30.30%	13.84%	16.46%
and Pus Cells	95.38%		

TABLE NO. 2

CULTURE REPORT

Staphylococcus pyogenes	55.00%	Proteus vulgaris	0.61%
Non Haemolytic Streptococcus	17.69%	Beta Haemolytic Streptococcus	3.07%
Haemolytic Streptococcus	7.38%	Streptococcus Pneumoniae	0.30%
Alpha Haemolytic Streptococcus	4.76%	Pseudomonas aeruginosa	0.15%
Streptococcus viridans	1.23%	Escherchia coli	9.69%
Haemophilus influenza	0.61%	Klebsiella pneumoniae	0.46%

TABLE NO. 3
SENSITIVITY AND RESISTANCE OF ANTIBIOTICS TO ORAL BACTERIA
(1974 – 1979)

	Resistance	Sensitivity
1. Albamycin	97.00 %	3.00 %
2. Penicillin	87.00 %	13.00 %
3. Tetracyclines	80.00 %	20.00 %
4. Streptomycin	75.00 %	25.00 %
5. Vibramycin	72.00 %	28.00 %
6. Ceporan	61.00 %	39.00 %
7. Pyopen	53.00 %	47.00 %
8. Ampicillin	52.00 %	48.00 %
9. Co-Trimoxazole	38.00 %	62.00 %
10. Erythromycin	35.00 %	65.00 %
11. Lincocin	33.00 %	67.00 %
12. Cloxacillin	31.00 %	69.00 %
13. Kanamycin	20.00 %	80.00 %
14. Gentamycin	11.00 %	89.00 %
15. Chloramphenicol	5.00 %	95.00 %

TABLE NO. 4
ORAL BACTERIA (1974 – 1979) – SENSITIVITY AND
RESISTANCE OF STAPHYLOCOCCUS PYOGENES TO VARIOUS ANTIBIOTICS

	Resistance	Sensitivity
1. Ampicillin	68.11 %	31.88 %
2. Chloramphenicol	3.17 %	96.42 %
3. Lincocin	8.41 %	91.58 %
4. Cloxacillin	7.65 %	92.34 %
5. Erthramycin	15.31 %	84.68 %
6. Kanamycin	17.09 %	82.90 %
7. Septran	43. %	57. %
8. Pyopen	54.08 %	45.91 %
9. Ceptretodoxon	78.82 %	21.17 %
10. Tetracyclin	87.75 %	12.24 %
11. Streptomycin	88.01 %	11.98 %
12. Vibramycin	89.28 %	10.71 %
13. Penicillin.	98.97 %	1.02 %
14. Gentamycin	03.82 %	96.17 %

TABLE NO. 5
ORAL BACTERIA (1974-1979)
SENSITIVITY & RESISTANCE OF ALPHA HAEMOLYTIC
STREPTOCOCCUS TO VARIOUS ANTIBIOTICS

	Resistance	Sensitivity
1. Ampicillin	NIL	100.00 %
2. Chloramphenicol	NIL	100.00 %
3. Lincocin	61.53 %	38.46 %
4. Cloxacillin	92.30 %	7.69 %
5. Erythromycin	88.46 %	11.53 %
6. Kanamycin	76.92 %	23.07 %
7. Septran	57.69 %	42.30 %
8. Pyopen	7.69 %	92.30 %
9. Ceptretodos	70.07 %	26.92 %
10. Tetracyclin	42;30 %	57.69 %
11. Streptomycin	100.00 %	NIL
12. Vibramycin	23.07 %	76.92 %
13. Penicillin	92.30 %	7.69 %
14. Gentamycin	84.61 %	15.38 %

TABLE. 6
ORAL BACTERIA (1974-1979)
SENSITIVITY & RESISTANCE OF NON-HAEMOLYTIC
STREPTOCOCCUS TO VARIOUS ANTIBIOTICS

	Resistance	Sensitivity
1. Ampicillin	3.57 %	96.42 %
2. Chloramphenicol	NIL	100.00 %
3. Lincocin	73.21 %	26.78 %
4. Cloxacillin	89.28 %	10.71 %
5. Erythromycin	82.14 %	17.85 %
6. Kanamycin	82.14 %	17.85 %
7. Septran	25.89 %	74.10 %
8. Pyopen	6.25 %	93.74 %
9. Ceptretodos	56.24 %	43.75 %
10. Tetracyclin	71.42 %	28.57 %
11. Streptomycin	93.75 %	6.25 %
12. Vibramycin	35.71 %	64.38 %
13. Penicillin	95.53 %	4.46 %
14. Gentamycin	66.07 %	33.92 %

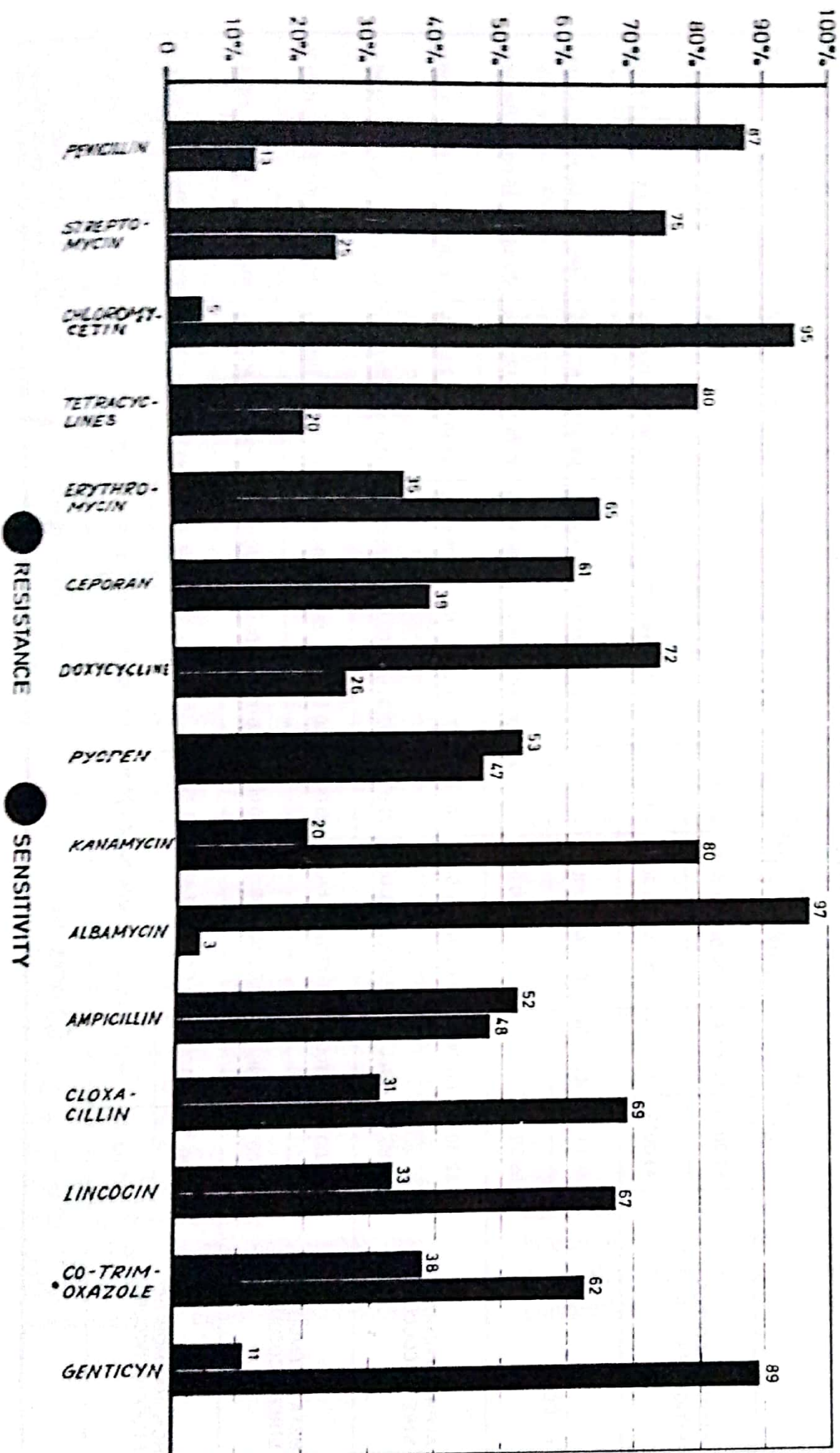
TABLE NO. 7
ORAL BACTERIA (1974-1979)
SENSITIVITY & RESISTANCE OF BETA HAEMOLYTIC
STREPTOCOCCUS TO VARIOUS ANTIBIOTICS

	Resistance	Sensitivity
1. Ampicillin	NIL	
2. Chloramphenicol	NIL	100.00 %
3. Lincocin		100.00 %
4. Cloxacillin	10.00 %	90.00 %
5. Erythromycin	80.00 %	20.00 %
6. Kanamycin	100.00 %	NIL
7. Septran	80.00 %	20.00 %
8. Pyopen	60.00 %	40.00 %
9. Ceptretodos	NIL	100.00 %
10. Tetracyclin	90.00 %	10.00 %
11. Streptomycin	50.00 %	50.00 %
12. Vibramycin	100.00 %	NIL
13. Penicillin	20.00 %	80.00 %
14. Gentamycin	40.00 %	60.00 %
	70.00 %	30.00 %

TABLE No. 8
ORAL BACTERIA (1974-1979)
SENSITIVITY & RESISTANCE OF ESCH. COLI TO
VARIOUS ANTIBIOTICS

	Resistance	Sensitivity
1. Ampicillin		
2. Chloramphenicol	20.00 %	80.00 %
3. Lincocin	NIL	100.00 %
4. Cloxacillin	100.00 %	NIL
5. Erythromycin	95.38 %	4.61 %
6. Kanamycin	100.00 %	NIL
7. Septran	12.30 %	87.69 %
8. Pyopen	55.38 %	44.61 %
9. Ceptretodos	10.76 %	89.23 %
10. Tetracyclin	15.39 %	84.61 %
11. Streptomycin	96.92 %	3.07 %
12. Vibramycin	78.46 %	21.54 %
13. Penicillin	86.15 %	13.84 %
14. Gentamycin	100.00 %	NIL
	3.08 %	96.92 %

SENSITIVITY AND RESISTANCE OF DRUGS TO ORAL BACTERIA (1974 — 1979)



ORAL BACTERIA (1974-79)

SENSITIVITY & RESISTENCE TO VARIOUS ANTIBIOTICS

% DISTRIBUTION OUT OF 650 CASES

	Co-Trimoxazole	Chloramphenicol	Tetracycline	Erythromycin	Ceporan	Penicillin	Streptomycin	Doxycycline	Pyopen	Kanamycin	Lincomycin	Ampicillin	Cloxacillin
STAPHYLOCOCCUS PYOGENES	57.00 %	96.42 %	12.24 %	84.69 %	21.17 %	1.02 %	11.98 %	10.71 %	45.91 %	82.90 %	91.58 %	31.88 %	92.34 %
	43.00 %	3.57 %	87.75 %	15.30 %	78.82 %	98.97 %	88.01 %	89.28 %	54.08 %	17.09 %	8.41 %	68.11 %	07.65 %
E. COLI	44.61 %	100.00 %	3.07 %	NIL	84.61 %	NIL	21.53 %	13.84 %	89.23 %	87.69 %	NIL	80.00 %	4.61 %
	55.38 %	NIL	96.92 %	100.00 %	15.38 %	100.00 %	78.46 %	86.15 %	10.76 %	12.30 %	100.00 %	20.00 %	95.38 %
ALPHA HAEMOLYTIC STREPTOCOCCUS	42.30 %	100.00 %	57.69 %	11.53 %	26.92 %	7.69 %	NIL	76.92 %	92.30 %	23.07 %	38.46 %	100.00 %	7.69 %
	57.69 %	NIL	42.30 %	88.46 %	73.07 %	92.30 %	100.00 %	23.07 %	7.69 %	76.92 %	61.53 %	NIL	92.30 %
BETA HAEMOLYTIC STREPTOCOCCUS	40.00 %	100.00 %	50.00 %	NIL %	10.00 %	60.00 %	NIL	80.00 %	100.00 %	20.00 %	90.00 %	100.00 %	10.71 %
	60.00 %	NIL	50.00 %	100.00 %	90.00 %	40.00 %	100.00 %	20.00 %	NIL	80.00 %	10.00 %	NIL	89.28 %
NON HAEMOLYTIC STREPTOCOCCUS	74.10 %	100.00 %	28.57 %	17.85 %	43.75 %	4.46 %	6.25 %	64.28 %	93.74 %	17.85 %	26.78 %	96.42 %	20.00 %
	25.89 %	NIL	71.42 %	82.14 %	56.24 %	95.53 %	93.74 %	35.71 %	6.25 %	82.14 %	73.21 %	3.57 %	80.00 %

☐ SENSITIVE

☐ RESISTENCE

DISCUSSION

Kelstrup (1977), has observed that bacteria of the mouth are similar throughout the world. The difference he found, is mostly of a quantitative nature and this he relates to the different dietary patterns. In our study the second group of organism was belonging to the genus streptococcus whereas, Staph. pyogenes was predominant in addition to other group of organisms. Similar study was made by Niom (1977) that bacteria was demonstrated in the cavities. Glickman (1963) observed several bacteria are found in smears in acute necrotizing gingivitis cases, and other workers like Mitchell (1956), Merrit (1933), Lapira (1943), Daley (1928), Coutely (1943), Appleton (1929), Bettman and Ratte (1930), co-related *Borrelia* Vincenti, *Bacillus fusiformis*, Filamentous organism (*Actinomyces* or *Leptotrichia*) *Streptococcus*, *Vibrio*, *Treponema microdentium* as the cause of disease. In our study, we have found the relative proportion of all such organism in our sample because our patients were not in acute state, but they were of advanced nature of periodontal disease. Therefore we could only detect in our direct smears Gram Positive Cocci-44.61%, Gram Negative Cocci-2.61%, Fusiformis *Spirochaetes*-30.30%, and Pus Cells in 22.47% and the pathogenic organisms were isolated in the following proportion of cases: *Staphylococcus*

pyogenes 55.00%, Non Haemolyticus *Streptococcus*-17.69%, Haemolytic *streptococcus*-7.38%, Alpha haemolytic *Streptococcus*-4.76%, *Hamophilus influenza*-0.61%, *Proteus vulgaris*-0.61%, Beta haemolytic *streptococcus*-30.07%, *Pseudomonas aeruginosa*-0.15%, *Escherchia coli*-9.69%, *Klebsiella pneumoniae*-0.46%, Glickman (1963) also has agreed that the chronic inflammation is the most common local condition responsible for bone loss and he is of the opinion that the toxic effect of bacteria and other toxins upon the osteocytes is responsible for the bone loss. Potential organisms isolated in periodontal lesion could not be demonstrated in other ways. However, cases have been reported better general health after eradication of periodontal infection which has been associated for a long time with their common complaints like fever of unknown origin, joint problems and eye infection. We also could not demonstrate the pathogenicity of our bacteria in experimental animals. However, Lindhe (1977), has used the chlorhexidine on chronic gingivitis wound in dog. Courant et.al. (1968) also made an experiment of bacteria on the dog and it has been proved that the dog could develop gingivitis as a result of infection. Sage et.al. (1967) has done the experiment on the dog in connection with the periodontal dis-

ease. Darwish et.al. (1973), Foley et.al. (1942), Macdonald et.al. (1954) and (1956) found that the exudate obtained from periodontal disease caused pathological lesions in animals.

Various workers like Gibbons et.al. (1966) and (1968), Irving et.al. (1973), Gordan et.al (1972), Kaslick et.al. (1975), Kelstrup et.al. (1970), Loesche et.al. (1975) and (1977), and Socransky et.al. (1970), demonstrated that Gram positive organisms from human oral cavity can initiate periodontal destruction in gnotobiotic rats. Some of the strains they included were *Streptococcus mutans*, *S. salivarius*, *Actinomyces baeslundii*, *A. viscosus*, *Bacillus* species, and *Nocardia*. More recently, certain gram-negative isolates have been shown to be periodontopathic as monocontaminants in gnotobiotic rats. Carranza (1978) stated that there is evidence for a primary bacterial etiology in periodontal disease. Similar to our study, he has mentioned that no specific agents causing periodontal destruction has been isolated. Goldhaber et.al. (1964), Mitchell et.al. (1968), Sehussler (1945), have demonstrated bacterial etiology in the form of periodontal disease for treating acute cases of gingivitis with systemic administration of antibiotics proved to be effective in the disease (AUG). Similar in our culture report and specific antibiotics according to the sensitivity reports were pre-

scribed to the patients and it has provided us positive results which has proved the co-relation of the bacterial involvement and association with the periodontal disease. After the effectiveness of particular antibiotic for one or two days, the calculus deposits have been designed to be removed. Oral hygiene was maintained by removing the plaque by the patients and other procedures. The periodontal disease with this therapy in our study has shown the decline trend. We have achieved 99% success. O'Leary et.al. (1962), Ash et.al. (1964), Arno et.al. (1958) have made co-relation between the incidence of gingivitis to brushing and plaque formation. Hassell et.al. (1977) considered organisms derived from plaque as etiologic agents for gingivitis and periodontitis because plaque has complex microbial flora. Slots (1977) cultivated micro flora inhibiting clinically healthy gingival sulci and pockets in middle aged subjects and compared it with deep periodontal pockets of the 350 strains cultured in which approximately one fourth were obligate anaerobes, 15% were gram negative and 56% were gram-positive rods. Gram-positive anaerobic and facultative anaerobic rods comprised 44.6%. Cultured organisms of the gram positive rods isolated. Out of these about 20% were obligate anaerobes and 8% were facultative anaerobes—this shall lead towards the specific microbial etiologies for periodontal disease.

In our study (1974-1979), on Sensitivity and Resistance of Oral Bacteria to antibiotics (Table No. 3), we have found 97% resistance for Penicillin (Alexander Fleming (1881-1955), British microbiologist reported in 1929) whereas Chloramphenicol shows 5% resistance to all bacteria mentioned in table No. 2. Ampicillin has also shown 52% resistance and Doxycycline hyclate (Vibramycin) has developed 72% resistance whereas Tetracyclines has shooted up to 80% resistance.

Krause (1981), while arguing for cause of infectious disease mentioned that the problems are becoming more common because bacteria can develop resistance to antibiotics which were once thought a guarantee cure and he gave an example of Penicillin. He attributed cause of the resistance is the production of enzyme. Vollum et.al. (1973), observed that the organisms may develop resistance to antibiotic in many ways. In case of Penicillin they mentioned that many organism have the ability to produce an enzyme "Penicillinase". This enzyme can destroy the antibiotic and this is basis of resistance to the penicillin resistance strains of staphylococci. Penicillinases are also produced by strains of *E.coli*, *Proteus* spp., and *Bacillus* spp. among others. In our study 55% *Staph. pyogenes* are resistant 98.97% to Penicillin. It is also said that Gram positive and Gram negative bacilli and cocci

also produce penicillinase and in our Table No. 2. we have found gram positive Cocci 44.61% and Fusiformis 30.30% and that gives cause of Resistance.

Streptomycin was discovered in 1944 by Waksman and Co Workers. This bactericidal drug too has shown 75% resistance in Table No.3 Drug Kanamycin is also bactericidal drug, has shown 25% resistance in same table. Vollum et.al. (1973), have expressed that Streptomycin can develop rapidly resistance and he has advised for its use in combination with other antibiotics.

Over all Chloramphenicol is drug sensitive 95%. (Table 3). This drug has been isolated from a strain of *Streptomyces venezuela*. It is absorbed rapidly and diffuses widely in the tissue including the C.S.F. Like tetracyclines, is entirely bacteriostatic and it is a broad spectrum antibiotic.

Further to our study (Table No. 4) we have isolated the range of sensitivity of antibiotics to individual organism i.e. *Staphylococcus pyogenes* has shown 68.11% resistance to ampicillin and 31.88% was shown sensitivity. Similarly chloramphenicol has shown 96.42% sensitivity and the same range of sensitivity lincocin-91.58%, Cloxacillin-92.34%. Erythramycin-84.69%, Kanamycin-82.90%, Septran-57.39% respectively in Table No. 4 and the lowest sensitivity was

observed with Penicillin 1.02%.

The reason of getting resistance can be measured by the misuse of the drug and production of enzyme penicillinase. Penicillin has been used enormously after its invention in 1929 all over the world and due to miscalculated dose, the drug has developed enormous resistance to staphylococcal infection in our study. However, this drug has shown 60% effectiveness against beta haemolytic streptococcus. But for Alpha haemolyticus (Table No. 5), the drug has shown 2.69% effectiveness whereas for non Haemolyticus Streptococci (Table No. 6), has shown 4.46% effectiveness. Contrary to the Penicillin (Table No. 4), ampicillin has 31.88% effectiveness for Staphylococcus pyogenes whereas in Table No. 5. Ampicillin has shown 100% effectiveness against Alpha haemolytic streptococcus and effectiveness in Table No. 6. for non-haemolyticus streptococcus and in Table No. 7. Ampicillin again has shown 100% effectiveness for Beta haemolyticus and in Table No. 8. ampicillin has shown 80% effectiveness to E.Coli. The more important drug (Chloramphenicol) with reference to Table No. 4, 5, 6, 7, & 8, has shown nearly 100% competency to combat the disease.

Similarly the drug which is being commonly used has developed and are developing resistance to antibiotic

which has been explained clearly in various tables. The more the drug is being used at irregular dose without the Physician's advice and the environment of the patient, the resistance to the drug has become the common feature.

CONCLUSION

Periodontal disease is being caused by bacteria (Table No. I and II), a few are known to us in our study (1974-79), but larger are more to be detected through other studies and systems of identification with special medium, particular environment of facilities of technique and technology of laboratory. Let us stress ourselves to identify the cause and then prescribe the drug. By this, consciousness of mind response to my treatment and line of action remained ideal in recovery and confidence of patients and satisfaction to myself.

The choice of a drug to be used for treatment may be asked on the results of the vitro sensitivity test, for particular strain of bacteria in disease.

We have identified oral pathogens affecting the periodontal apparatus and due to our bacteriological results and sensitivity and resistance reports, a headway has been made, how, when, where and which antibiotic may be used to each bacteria in terms of choice?

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NUTRITIONAL BIOCHEMISTRY SURVEY OF PARAMEDICAL STUDENTS

Shahadat Khan, M. Phil*

Abstract

Some 122 paramedical students, aged 16 to 42 years, were screened for blood pressure, few biochemical parameters and general anthropometric characteristics. About 66% were underweight and 10% had hypertension. Serum cholesterol values exceeded 250 mg/100 ml in 5% and haemoglobin values were below 12.5 g/100 ml blood in 22% cases (range: 9.5–12.4g). Subjects over 30 years were shorter and had significantly higher mean weight, triceps skinfold thickness, diastolic pressure and serum cholesterol values than the youngsters.

Introduction

Several recent studies¹⁻⁴ have consistently reported sub-standard nutritional status of Pakistani women. A relationship between the socio-economic status and certain nutritional factors has also been studied.⁵ How-

ever, there is little data on men. This study was therefore conducted to measure the nutritional status of underprivileged students.

Material and Methods

A nutritional biochemistry survey of 122 male paramedical students (MPS) of College of Community Medicine, Lahore, ranging in age from 16 to 42 years, was completed in July, 1984. The examination included measurement of height, weight, triceps skinfold thickness and blood pressure. Physical characteristics were measured in the way described in a previous study.³ Eighty three subjects (68%) consented to give blood for biochemical studies.

Haemoglobin was determined promptly after collection of blood by the cyanmethaemoglobin method. Serum was separated from the clotted samples. Subsequent determinations included measurements of total protein by the Biuret method, albumin

family size, family income, father's occupation and residential area) were recorded during an interview. Height, weight and skinfold thickness were measured in the way described in a previous study.⁸ Subjects weighing 10% or more above the established standards¹⁰ were considered obese for this study, since it has been suggested to be a suitable dividing line between overweight and obesity.¹¹ Other students weighing between 100-110% of the desirable weights were classified as overweight.

Results and Discussion

Overall, 737 subjects were studied and out of these 10.5% had excess weight; 7.2% being overweight and 3.3% obese (Table). Using obesity standards produced by Seltzer and Mayer,¹² 3.8% of the subjects were noted to be obese. The difference is however, insignificant and indicates that both the scales (measurement of weight and measurement of triceps skinfold thickness) are reasonably accurate in noting obesity. The prevalence of obesity is quite considerable in Western Countries; during puberty it has been estimated as 10-15%^{13,18} and it may be more than 25% of the total population.²

The prevalence of both overweightness and obesity tended to be low in youngsters than those aged over 20

years (8.2% vs. 12.7%, Table). This is quite consistent with our earlier finding.⁸ Prospective studies¹⁴ have shown that 80% of obese children may remain obese in young adult life also.

As can be seen from the Table, excess weight occurred in similar proportions in those living in boarding house and those at home (10.6% vs. 10.4%); however, it was interesting to note that 4.6% of boarders were obese compared to 2.7% of dayschoolers. This is in keeping with the results of a previous study.⁸

Within the two different family size groups, i.e. up to 6 and 7 or more members per family, a negative association was found between excess weight and family size (11.4% vs. 9.6%, Table). It has been shown that the poorer the families the larger they are, and in turn experience shortage of food available per person with resultant malnutrition.¹⁵

Studies in both New York City and London² suggest that in the lower economic group there is a greater prevalence of obesity. The results of this study however, show that excess weight occurred more commonly among students from the affluent community than their less fortunate classmates (14.1% vs. 7.1%). This is in conformity with the results of an

earlier study carried out by the author.⁸

The prevalence of excess weight according to father's occupation is presented in the Table. As expected, excess weight was much more prevalent in the subjects whose fathers were either professional or senior government/army officers or business men or landlords than those whose fathers were either shopkeepers or office/agricultural workers with a low and irregular income (15.8% vs. 4.6%). It has been fairly well established that prosperity can produce the 'self-induced' diseases of affluence such as obesity, heart disease and diabetes.¹⁶

The number of overweight/obese subjects from urban area was much higher than those from rural area, the percentages being 11.9 and 6.6% respectively (Table). This is in agreement with the findings of Underwood et al.¹⁷ who found that 7.5-10% of the lower income populations in Pakistan were overnourished and of these 91% of males and 85% of females resided in urban areas.

The results of this study indicate that the prevalence of overweightness and obesity was high in the subjects studied and it may continue or even increase in later years of life as already shown in prospective studies.¹⁴

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Table: Percentage of students underweight, normal and above normal weight

	No.	Under weight %	Normal %	Over weight %	Obese %	OW & obese %	Total %
a) Total	737	64.4	25.1	7.2	3.3	10.5	100.0
b) By age							
≤ 20 years	365	72.9	18.9	6.3	1.9	8.2	100.0
> 20 years	372	56.2	31.1	8.1	4.6	12.7	100.0
c) By accommodation							
Boarder	217	61.3	28.1	6.0	4.6	10.6	100.0
Dayscholar	520	65.8	23.8	7.7	2.7	10.4	100.0
d) By family size							
Small	341	60.7	27.9	7.6	3.8	11.4	100.0
Large	396	67.7	22.7	6.8	2.8	9.6	100.0
e) By economic status							
Low	383	72.8	20.1	5.0	2.1	7.1	100.0
High	354	55.4	30.5	9.6	4.5	14.1	100.0
f) By occupation of father							
Professionals & Administrators	95	57.9	26.3	10.5	5.3	15.8	100.0
Shopkeepers, Office & Agricultural workers	108	80.6	14.8	3.7	0.9	4.6	100.0
g) By area							
Rural	60	71.7	21.7	5.0	1.6	6.6	100.0
Urban	143	69.2	18.9	8.4	3.5	11.9	100.0

INCIDENCE OF OBESITY IN MALE MEDICAL STUDENTS

Shahadat Khan, M. Phil*

Abstract

The prevalence of overweightness and obesity in relation to age, accommodation, family size, family income, father's occupation and residential area was assessed in 737 male medical students. Only 10.5% of them had excess weight, 7.2% being overweight and 3.3% obese. Excess weight was positively associated with age, family income and father's occupation but a reversal occurred with family size; however, it was present in similar proportion in boarders and day-scholars and declined considerably from urban to rural area.

Introduction

It is well known that obesity has serious consequences on health¹. Mortality ratio is higher in obese individuals particularly men aged 20-40 years.² In later life, complications like diabetes, hypertension, other cardiovascular diseases and affections of joints are also liable to make their appearance.³ The major cause of obesity is overeating. Faulty fat

metabolism also plays some role.⁴ In working population in London, 30.8% of men and 38.6% of women were more than 20% above their ideal weight for height.⁵ Even 16% of men and 25% of women in the Nutrition Society were reported to be overweight.⁶ Likewise, in German Democratic Republic, 32.6% of the entire population were noted to be overweight.⁷ Previous studies undertaken by this unit also showed that 19% of Pakistani female medical students and 11% of LHV students had excess weight.^{8,9} In general however, information about obesity in Pakistani young population is meagre. This study was aimed to assess the prevalence of overweightness and obesity in young men.

Material and Methods

Study under report was carried out on a randomized sample of 737 students (in apparently good health) of Allama Iqbal Medical College, Lahore, aged 17-26 years. Descriptive characteristics (age, accommodation,

by the method of Doumas et al⁶ and urea by treatment with urease and then nesslerization. Serum alkaline phosphatase⁷ and total serum cholesterol⁸ were estimated by standard methods.

Results and Discussion

Mean and standard deviations of anthropometric and blood pressure data of the MPS are presented in Table 1. Subjects aged 31-42 years had significantly higher mean values of weight and triceps skinfold thickness ($P < 0.01$) than youngsters but their mean height declined by 2.5 cm. Nearly 66% were below 90% of standard weights⁹ (1.6, 16.4 and 48.3% were between 60-69, 70-79 and 80-89% respectively). The maximum mean weight-to-height ratio in this study was 0.39 compared with 0.44 for Canadian¹⁰ and American men.¹¹ Only 2 students (1.6%) measured 180 cm while none measured 150 cm or less. In the American adult male population, 15% measure 180 cm or more and about 1% measure less than 150 cm.¹¹ Appreciable differences in height between the younger and older age groups presumably represent secular changes. These differences which are in the form of positive increments may be attributed to better diet resulting from improved economic status, food availability, educational level and general living conditions.

Mean systolic and diastolic blood pressure values showed an upward

trend with weight and age (Table 1). The proportion of subjects arbitrarily defined as hypertensive (≥ 160 mm Hg systolic or ≥ 95 diastolic) in the current study was 10% compared with 17% for Asians.¹² The age breakdown revealed that 31-42 year olds had appreciably higher prevalence of hypertension (41.6%) than either 21-30 year olds (9.4%) or 16-20 year olds (3.5%). Subjects aged 31-42 years did have higher diastolic pressure ($P < 0.01$) than their younger classmates but systolic pressures were not significantly different. The former group was significantly heavier than the latter and thus they should have had higher blood pressure values.¹³

None of the biochemical parameters studied were significantly different between the three age groups (Table II) except higher mean level of cholesterol in 31-42 year olds ($P < 0.05$) which is in consonance with the finding of higher mean weight in this group. The changes in body weight are significantly related to the changes in serum cholesterol;¹⁴ its level also increases with age.¹⁵ Considering all age groups together, the biochemical determinations yielded average values which, on the whole, fell within the normal range.⁷ Further analysis of the data shows that 22% of the present group had haemoglobin values below 12.5 g/100 ml (range: 9.5 - 12.4 g) and serum urea was low (12.5 mg/100 ml) in only one subject. Nearly 18% had serum cholesterol

values above 200 mg/100 ml and in 5% it exceeded 250 mg/100 ml. There is considerable evidence to show that the risk of ischaemic heart disease increases as plasma cholesterol increases above 200-250 mg/100 ml.¹⁶

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Table I. Anthropometric and Blood pressure (BP) data by age [mean $\pm$ SD]
Age (years)

	≤ 20 I 57	21 - 30 II 53	31 - 42 III 12	Total 122
Number				
Weight, kg	54.6 $\pm$ 6.8	58.3 $\pm$ 7.6*	64.0 $\pm$ 11.3*	57.2 $\pm$ 8.1
Height, cm	166.9 $\pm$ 5.7	167.2 $\pm$ 4.8	164.7 $\pm$ 4.8	166.8 $\pm$ 5.2
Wt-to-Ht ratio	0.33	0.35	0.39	0.34
Triceps skinfold, mm	7.5 $\pm$ 3.0	8.0 $\pm$ 3.8	11.3 $\pm$ 4.1**	8.1 $\pm$ 3.6
Systolic BP, mm Hg	127 $\pm$ 14.8	129 $\pm$ 14.4	134 $\pm$ 15.4	129 $\pm$ 14.7
Diastolic BP, mm Hg	80 $\pm$ 9.5	81 $\pm$ 10.5	91 $\pm$ 11.1 $\neq$	81 $\pm$ 10.5

* $>$ than I ($P < 0.01$); ** $>$ than I & II ($P < 0.01$; $P < 0.05$); $\neq$ $>$ than I & II ($P < 0.01$)

Table II. Haematological and Biochemical parameters [mean $\pm$ SD]

	≤ 20 I 42	21 - 30 II 33	31 - 42 III 8	Total 83
Number				
Total protein, g/100 ml	7.4 $\pm$ 0.5	7.3 $\pm$ 0.6	7.4 $\pm$ 0.3	7.3 $\pm$ 0.5
Albumin, g/100 ml	4.7 $\pm$ 0.2	4.8 $\pm$ 0.2	4.7 $\pm$ 0.1	4.7 $\pm$ 0.2
A/G ratio	1.9 $\pm$ 0.5	2.0 $\pm$ 0.5	1.8 $\pm$ 0.3	1.9 $\pm$ 0.5
Urea, mg/100 ml	20.0 $\pm$ 3.0	19.8 $\pm$ 2.5	20.0 $\pm$ 2.3	19.9 $\pm$ 2.7
Alk. Phosphatase, K.A. units/100 ml	6.5 $\pm$ 1.7	6.0 $\pm$ 1.8	6.6 $\pm$ 1.8	6.3 $\pm$ 1.7
Cholesterol, mg/100 ml	168 $\pm$ 37.2	176 $\pm$ 36.6	189 $\pm$ 22.7*	173 $\pm$ 36.1
Haemoglobin, g/100 ml	13.7 $\pm$ 1.5	13.8 $\pm$ 1.6	13.9 $\pm$ 2.0	13.8 $\pm$ 1.6

* $>$ than I ($P < 0.05$)

DIET AND CANCER

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Heightened interest in three of the most dreaded diseases, heart disease, cancer and stroke has resulted in periodic efforts to 'improve' food habits especially by the developed countries. The developing countries normally adopt these recommendations since they are not in a position to generate high quality data of their own. Approximately 20% of all deaths in the United States are caused by cancer. Cancer is going to become a major public health problem in this country within the next ten years or so. As the incidence of preventable diseases drops, that of cancer will rise.

Results for England and Wales and also for the United States for the present century show that overall there has been a slight increase in mortality from malignant disease in males and a slight decrease in females. When one excludes lung cancer, which is predominantly due to smoking, the over-all trend is a decline in all other malignancies for both sexes. However, examining some specific sites there is a variation in trend, with some showing a predominant increase and others a predominant decrease during the

century. Two main conclusions can be drawn from these results, there has not been an explosion in cancer in the present century which indicates that the recent changes in environment, in particular the production and use of chemicals, have not resulted in a more carcinogenic environment than it was at the beginning of the century. Genetic predisposition to cancer exists for many sites, though it is only responsible for a very small contribution to the overall risk of developing cancer. Thus subjects with polyposis coli have a very high risk of colon cancer but this probably accounts for only about one in 200 people in the total population developing such cancers (1, 2).

It is generally assumed that about 90% of the variation in risk of malignant disease is due to specific environmental factors (3). A major cause of cancer in developed countries and to a lesser extent in developing countries is smoking. This accounts for about a third of male cancer deaths in England at present with a lower proportion in women (4).

Lung cancer ranks second in overall cancer incidence rates for the USSR and first among malignant

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neoplasms in males. A continuous increase in lung cancer incidence has been observed over the years and the increase is greatest in males and may probably be related to smoking, occupational hazards, and air pollution by industry and traffic (5).

There are a number of particular occupational hazards which may have a major impact on those exposed to them but they contribute only slightly to the overall toll of malignant disease. In a recent review it was suggested that life style was a particular determinant of risk of malignant disease(6).

Oesophageal Cancer:

Oesophageal cancer has wide variation across the world with a belt of high mortality stretching from Africa through the middle East into China. It is one of the sites of malignancy with the greatest international variation and in Northern Iran, major variation within one country. Collation studies and case-control studies have indicated in some populations an association between excess alcohol intake and risk of oesophageal cancer(7, 8). The case control study in France has shown a multiplicative effect of smoking and alcohol, yet the very high risk population in Iran are teetotallers. Detailed case control studies in Iran have been unable to identify specific nutritional factors

responsible for variation in risk though the high risk population consists of poor people living on a diet which consists mainly of bread. Two case control studies indicate that vitamin C inhibits the risk for oesophageal cancer(9, 10).

Stomach Cancer:

Higginson reports an inhibition of risk for stomach cancer by vitamin C (11), while a number of case control studies have been unable to identify any dietary factors consistently associated with excess of gastric cancer. It has however, been consistently shown that controls have an increased intake of green and fresh vegetables(12). Smoked food was considered a causal factor for gastric cancer in Iceland(13), but irrelevant in Japan where smoked food is not consumed to any significant degree. Lard consumption is associated with stomach cancer in Netherland but it is irrelevant for Japan and Korea. Rice and Talcum adhering to it were incriminated in Japan(14), but these factors are irrelevant for Portugal or Eastern European Countries. Milk consumption was considered a protective factor in Japan but a much higher consumption of milk in Finland was associated with high rates of gastric cancer. Cereals have a strong positive relation with gastric cancer. The five year survival rates of gastric cancer are still as low as in 1970, its incidence however, is

decreasing all over the world.

There is a strong positive correlation between cerebrovascular accidents and gastric cancer.

Both are high in Eastern Europe and Portugal and low in USA; both are medium in England and Wales. There is an even stronger positive correlation within a given country and within a group of countries. Both gastric cancer and cerebrovascular accidents are more common among lower social classes. All these relationships hold for both the sexes.

The relationship between cerebrovascular accidents and gastric cancer is so strong, so linear over a wide interval of values, so consistent in countries as different as England and Japan and so predictable that an artifact of origin can be ruled out with certainty. The linking factor 'x' is a typical environmental factor, therefore most certainly of nutritional origin. It must be identical in western world, Eastern Europe and Japan and must be found in decreasing amounts with time in almost all countries. It is a factor with a great impact on public health and this is consistent with the fact that total mortality over 45 years of age decreases with decreased stomach cancer in a given country. If regression between mortality from all causes except gastric cancer and that from gastric cancer is calculated, it becomes obvious

that each death from gastric cancer is linked to 24 deaths from other causes and this quantitative relationship is about four times higher than the one found for lung cancer. Joossen and Goebbers suggest that the linking factor 'x' is the common salt(15).

The salt added to food or already in food could act on cerebrovascular accidents by increasing blood pressure but it could also irritate gastric mucosa by its high osmotic properties. Salt has the highest activity among nutrients in quantities greater than one gram and delays emptying of stomach through its action on the osmotic receptors in the duodenum, thereby prolonging contact of gastric mucosa with carcinogens in food. High salt intake produces gastritis in animals and is associated with a high prevalence of atrophic gastritis as in Japan. Gastritis is common in areas where cancer is prevalent as in Finland and Columbia. Atrophic gastritis provides optimal conditions for nitrate formation and hence for formation of potent carcinogenic nitrosoamides. The delaying action of salt on stomach emptying may enhance the carcinogenic activity of these compounds. The salt hypothesis is also able to explain the decrease in stomach cancer over the years in practically all countries over the world and at the same time explains the decrease in stroke mortality long before any treatment for hypertension was

available e.g. in USA since 1925. It is highly probable that salt consumption is decreasing unconsciously all over the world due to the introduction of refrigeration techniques for food preservation as the reason for salt use in many foods is for preservation and not for taste.

Paradoxically gastric cancer is also associated with a low fat diet. Furyl furmide (AF-2) was used as an antimicrobial preservative in Japan between 1965-74, it has since been shown to cause increased chromosomal aberrations in cultured human lymphocytes and strong mutagenicity with E.Coli and it showed a dose related increase in squamous cell carcinoma of the fore stomach and has since been banned(16).

Colo-rectal Cancer:

Armstrong and Doll demonstrated a strong correlation between dietary fat and colon cancer confirming previous observations(17). Drasar and Irving also showed that the correlation was better with animal than with vegetable fat and better with bound than with free fat(18). This relationship is unlikely to be due to the presence of carcinogens in the diet as they are present in greatest amounts in the diets of populations with a low incidence of colon cancer. The most popular mechanism involves the intestinal bile acids which are metaboliz-

ed by the gut bacteria to compounds which have been shown to be cocarcinogenic in animal studies and in the salmonella mutagensis assay of Ames. The fecal bile acids increase with increased dietary fat and also correlate with the incidence of colon cancer in various countries around the world, in case control studies and in patients at increased risk of colon cancer.

A recent study in Nebraska shows that the risk of colon cancer was elevated among commercial beer drinkers, regardless of their ethnic background. An excess risk was also associated with intestinal polyps and with familial occurrence of gastrointestinal and other cancers(19).

Epidemiological studies do not show consistent protective effect of fibre on colon cancer. Some studies show a protective effect of cereals while other do not show this effect. In the positive studies cereal intake was also related to animal protein intake and also with cholesterol intake and when partial correlations were calculated controlling the animal protein or cholesterol intake, relationship with cereal intake was no longer significant. Food tables containing dietary fibre values are available for one or two countries of the world at present largely because of difficulties in fibre estimation and in the studies where actual estimation has been carried out, a clear protective effect against colon

cancer was observed(20). Physiological studies of the effect of fibre on large bowel function have shown that the pentose fraction was significantly correlated with mortality rates.

Macdonald suggests that the difference in colon cancer between high and low fiber consuming societies, could perhaps be due to some other yet unknown variable. The communities whose fibre consumption is considered to be high, tend to have a short life span and therefore do not survive to an age where colon cancer most frequently appears. Furthermore, the daily intake of fibre in developing countries may in fact be less than in western countries, because in the tropical areas less food is eaten and if fibre in fruits and vegetables is taken into account, it can be shown that in the United Kingdom for example, there has only been a slight fall in the past 100 or more years. It may be interesting to note that the greater the amount of wheat fibre ingested, the shorter is the life span. High fibre diets result in iron and zinc deficiencies in children and an increased incidence of intussusception(21).

Many studies show a clear increase in incidence of total cancer and colon cancer with decreases in serum cholesterol. This is particularly true for total cancer and serum cholesterol levels of less than 190 mg/100 ml (22-25). In a 10 years prospective

study of a Danish population of men and women exactly 70 years at entry and otherwise selected only according to geography, low serum cholesterol values were associated with excess cancer mortality while high serum cholesterol values were associated with excess cardiovascular disease mortality and with cardiovascular disease development. In women high values of serum triglycerides at 70 were associated with excessive admission to hospitals for cerebrovascular incidence alone(26).

Some animal studies show a protective effect of fibre while others do not show this effect. Dietary pectin, one of the most effective forms of dietary fibre for lowering cholesterol, has recently been studied for its influence on the development of uterus in mice and rats. The weight of uterus (both absolute and relative) was significantly reduced in both mice and rats on a high protein diet. Plasma cholesterol was also significantly reduced. Plasma cholesterol is a biochemical precursor of estrogenic hormones and a biochemical link between fibre and estrogen production is theoretically quite plausible. However it has yet to be determined whether other types of dietary fibre influence uterine development. These if applicable to humans, could be of considerable significance(27).

Liver Cancer:

Patients with liver cancer have a

higher prevalence of liver cirrhosis and the cirrhosis may be secondary to excess alcohol intake. However, prospective studies of individuals consuming excess alcohol have produced conflicting results. Furthermore the malignant disease mortality is not increased to the extent that case control studies would have suggested. Moderate alcohol use has been found in a variety of studies to lower risk of coronary heart disease and to raise the level of high density lipoprotein cholesterol which is associated with decreased risk of coronary artery-disease. However alcohol plays such an important role in accidents and in deaths from liver cirrhosis that the beneficial effects are negated.

Aflatoxins are potent liver carcinogens in a broad range of animal species and epidemiological studies in several tropical areas support the assumption that aflatoxins can cause liver cancer in man(28). Insect damage to the growing crop increases the severity and incidence of aflatoxin contamination.

Safarole, a flavouring material and a major constituent of sassafras, star-anise and camphor oils and a minor constituent of nutmeg oil and cinnamon leaf oil caused cirrhosis and massive deposits of ceroid pigments followed by development of benign and malignant liver tumours (hepatic cell carcinoma, hepatocholangioma

and hepatocholangiosarcoma). Human exposure to safarole cannot be stopped completely because as a natural substance it will always be present to some degree.

Pancreatic Cancer:

There is no clear dietary aetiological factor identified. Macmahon and associates have presented data to suggest that coffee intake may be related to increased risk of cancer of the pancreas(29) but Wynder and co-workers were unable to confirm this association in both males and females. However they observed a positive relationship of pancreatic cancer with smoking(30).

Lung Cancer:

Smoking appears to be of overriding importance in generation of this cancer. The executive summary of the National Research Council (USA) report, 1982, on diet, nutrition and cancer states; "it has become absolutely clear that cigarettes are the cause of approximately one quarter of all fatal cancers in the United States. If the population had been persuaded to stop smoking when the association with lung cancer was first reported, these cancer deaths would not be occurring. Twenty years ago the stop smoking message required some rather cautious wording. Today, the facts are clear and the choice of words is

not so important"(30).

However this statement is rather dogmatic in view of the five negative studies quoted by sterling(31). Two of these are life time studies by Azelson and Sundel and by Dahlgren on Swedish miners who found absolute higher rates of lung cancer among non-smokers than among smoking miners. Higher relative rates for non-smokers were also reported by Radford in the third study. The fourth study by Weiss on chloromethyl methyl-other workers reported a strong inverse relationship between smoking and lung cancer. In the fifth study by Pinto and co-workers, the lung cancer standard mortality ratio for smokers was only about half as large as that for non-smokers.

Dietary cholesterol was found to be positively and significantly associated with lung cancer risk in male subjects in a case control population study in Hawaii after statistically adjusting for age, ethnicity, pack-years of cigarette smoking and the association was consistent in all the five major ethnic groups in Hawaii(32). Risk of lung cancer was found to be considerably less among Danish male seventh day Adventists who do not smoke or drink alcohol(33).

There is some evidence that subjects regularly consuming vitamin 'A' in various forms have a lower risk of lung

cancer(34-36).

Breast Cancer:

Collation studies indicate its strong relationship with fat intake at the national level but case control studies have failed to identify any clear nutritional variation(37). De Waard has advocated high risk in obese women(38) though this is disputed by other workers(39). Cancer of the breast is associated with obesity, is less common in women whose age at first pregnancy was low, more common in western women, whose diet is traditionally high in fat, than in Asian or African women. It is also associated with endometrial and ovary cancer geographically and in persons with multiple primary carcinomas and with a high estrogen: androgen ratio. The association with diet is stronger in postmenopausal women and in a proportion of these women it appears to be estrogen dependent.

A proportion of breast cancers are estrogen dependant, whose production is known to be related to body fat and obesity. Estrogen dependant tumours including breast tumours contain larger number of estrogen receptors and are likely to respond to ablation therapy for removal of estrogen sources. Carrol in animal studies has obtained strong evidence for the role of dietary fat in breast cancer and has shown that dietary

fat has a tumour promoting effect(40). A recent study of the geographical distribution of breast cancer in USSR indicates a steady increase in breast cancer morbidity and mortality and is likely to be the leading cancer in females in the coming decades(41). Coffee is reported to cause lumps in the breast and birth defects. However Marshall and associates were unable to confirm these findings(42).

Uterus Cancer:

There is a high international correlation between uterus cancer mortality and fat consumption. The disease is associated with early menarche, late menopause, maturity onset diabetes, hypertension and obesity and all these conditions are enhanced by excess fat consumption. Vitamin C has been shown in some studies to reduce the risk of cancer of the cervix of the uterus. In a recent study, smoking was positively associated with the risk of development of uterus cancer but no dose response relationship was evident. The frequency of consumption of cruciferous vegetables and fat was also positively associated with the risk of development of uterus cancer but no dose response relationship was evident. The frequency of consumption of cruciferous vegetables and fat was also positively associated with the risk while B-carotene consumption index was negatively associated with the risk(43).

Ovarian Cancer:

A recent case control study showed

that the risk of development of this cancer was positively associated with coffee drinking. The relative risk estimates increased further when allowances were made for smoking habits(44). Another study in 30-49 year old women with epithelial carcinoma of the ovary found no significant risk association with consumption of alcohol, cigarettes, coffee, tea, total dietary proteins, vitamin C or fat at any stage. In the 30-49 years age group risk increased with low fibre and vitamin A from fruits and vegetables. Multiple regression analysis showed that the apparent protective effect of vitamin A but not of dietary fibre was independent of the other dietary factors studied(45).

Bladder Cancer:

The long term consumption of artificial sweeteners was suspected as the risk factor. However, Hoover and Strasser in reporting the preliminary findings of a large case control study found no evidence to support this view(46). Various other case control studies have produced conflicting results. Increased Coffee consumption has also been suggested as a risk factor. Nitro-soamine production was also identified as a risk factor; however, the study by International agency for research in cancer found no difference in the nitrosoamine content in food of bladder cancer patients and normal controls(47). A high risk of bladder cancer in coffee

drinkers was found in New England and Buffalo as compared to non-coffee drinkers(48), while a recent survey of 10 geographical areas of USA was unable to confirm these findings(49).

Prostate Cancer:

Mortality from prostate cancer has been on the increase in a number of western countries and collation studies suggest an association with increased fat intake. No case control study has been able to identify specific variation in the diet though Rotkin report increased intake of high fat and high cholesterol diets in these patients(50). A study of 260 patients with prostate cancer in USA indicated that the risk of prostate cancer increased with increased intake of retinoids, animal fats and vitamin C. These patients were compared with two different control groups of similar size and distribution(51).

Hodgkin's Disease:

Little is known about its specific etiology, Paffenbarger and associates as a result of a long term case control study suggest that obesity and coffee intake may be associated with increased risk of Hodgkin's disease(52).

Other Cancers:

Vitamin C has been shown to reduce cancer risk for mouth and larynx in

addition to the other sites discussed already(53,54). A recent case control study in North Carolina women showed the protective effect of a diet high in fruits and vegetable in the etiology of oral and pharyngeal cancers. These effects were evident even after controlling for demographic characteristics, tobacco and alcohol use, relative weight and intake of other food groups(55). Epidemiological evidence shows a tendency for some human cancer risks to be inversely associated with blood retinol, people with above average blood retinol levels or B-carotene intake are at low average risk of cancer(56,57). It is known for more than 50 years that vitamin 'A' is essential to maintain the normal differentiation of specialized epithelial tissues and its deficiency causes keratinization in many epithelial tissues and vitamin A deficiency is usually accompanied by hyperplasia of the affected tissue. The keratinization is reversible if the normal levels of vitamin — A are restored and this is true both in vitro and in vivo in organ culture. Carcinomas which are malignancies of the epithelial tissues, represent 95% of fatal malignancies in man as compared to malignancies of the supporting tissues or leukemias. Development of carcinomas always involves alteration in the normal differentiation of the tissues and cancer indeed is regarded by some people as disease of differentiation. Thus vitamin 'A' and analogues i.e.

the retinoids could be anticarcinogenic by reinforcing expression of the normal phenotypes and thus preventing expression of the new malignant phenotype. Retinoids possibly function like steroid hormones to control phenotypic expression. Some retinoids have been shown to prevent or inhibit the development of cancer in the rodent bladder, breast and skin in response to proven carcinogens. These experiments were carried out for a period of 4-9 months and a consistent reduction in incidence of papillomas and carcinomas was found at autopsy and the overall differentiation of the tumours and rest of the urothelium was better in retinoid fed animals. Current research in USA on in vivo models for cancer of the pancreas, prostate, oesophagus and colon suggests that retinoids may well prove useful as chemopreventive agents by shifting the time related response to carcinogens and in skin cancer the topical applications of high levels have been shown to have a direct therapeutic effect(58). However, Willet and his associates have recently studied the relationship of the intake and serum concentrations of the antioxidant vitamins i.e. vitamin 'A' and vitamin 'E' to the subsequent development of cancer in human subjects and were unable to find any correlation of these parameters with the risk of development of cancer(59).

The problems caused by the association of nitrites and nitrosoa-

mines with cancer are far more complex than for many other food additives, because their precursors nitrate and nitrite respectively, are common constituents of a normal diet. The nitrate ion is essential for plant growth and occurs in soil either naturally or added in the form of a fertilizer. Soil derived nitrate may be consumed by man in the form of plant material especially those concentrating nitrate such as celery, spinach and beet, and from drinking water. Apart from the possibility of thyroid effect, nitrate is absorbed from the small intestine, is secreted in the saliva and gastric juice and excreted in the urine. It is readily reduced to nitrite by bacterial action during unrefrigerated storage of food and also within the human body. Upto 10-12 mg nitrite/day may be produced by the body from saliva alone. It is nitrite from these sources together with that deliberately added to food as a preservative, that presents a toxic hazard to man due to (i) direct toxicity of nitrite (methemoglobinemia in children) (ii) formation of N-nitroso compounds (nitrosoamines and nitrosoamides) following reaction between nitrite and secondary and tertiary amines and amides. The carcinogenic potential of nitrites is questionable but that of carcinogenic amines has been well documented in recent years. However many of these studies have incorporated levels of administration far in

excess of the calculated likely exposure of humans to these materials. The Japanese eat a very high concentration of dried and salted foods, many of which may concentrate nitrite, whilst the world's largest nitrate mines are in Chile. However, establishing a positive causal relationship with stomach cancer or cancer of any other site may take many more years of effort. The eighth international meeting on N-nitroso compounds concluded that tyramine and 1, 2, 3, 4-tetrahydrocarboline 3-carboxylic acid present in soysauce can act as precursors for mutagenic compounds after nitrosation and on grounds of biochemical and histopathological data there is little reason to believe that humans are resistant to the carcinogenic action of N-nitroso compounds. Thus a causal association, although not yet rigorously established can not be excluded."(60).

Position in Pakistan:

Two multi centre studies were carried out in Pakistan under PMRC sponsorship in 1973-74 and 1977-80 respectively. However no attempt was made to record the dietary history of the cases studied(61, 62).

Effects of Cancer on Nutrition:

a) **General effects:** Many cancer patients show evidence of weight loss and reduction of body fat and

muscle mass. Many patients also have low plasma albumin concentration and measurement of biochemical indices of vitamin status suggest vitamin depletion. Thompson and associates have reported lowered serum concentrations of albumin, IgG, IgM transferrin in a population of otherwise healthy white women over 40 years of age with early stage breast cancer (63). If this condition of malnutrition continues, the syndrome known as cancer cachexia develops. This is characterized by anorexia and early satiety, an increase in basal metabolic rate and energy expenditure, the development of anemia, asthenia and changes in body composition and this suggests that there is a failure to adapt to a reduced food intake. There is evidence suggesting that tumours may produce peptides or other small molecules which cause enzyme disturbances in normal cells causing 'metabolic chaos', increase in energy expenditure and a release into the blood stream of aminoacids and peptides which enter the metabolic pool and are taken up by the tumour for growth of its tissue(64).

Fluid and electrolyte imbalances are common in patients with widespread metastasis, ascites and liver failure, with cardiac metastases and failure, with metastatic ovarian carcinoma and ascites, with renal failure secondary to obstruction of the urinary tract by tumour, with obstruction of

lymphatic or venous drainage in major areas. Hypoalbumenia and anemia are also frequently noted in advanced cancer cases. Normochromic normocytic anemia also frequently associated with cancer does not respond to nutrition factors. Radiation and chemotherapy may be contributing factors due to their depressive effects on the bone marrow.

Malnutrition in cancer results from poor food intake which may be due to appetite reduction, altered taste perception, pain, mechanical obstruction, apathy and depression in the face of an uncertain or poor prognosis. The requirements for some nutrients may be increased and in some patients there may be abnormal losses through fistulas. Malabsorption may further contribute to the problem. Emotional distress may cause transitional anorexia during the diagnostic workup and during times of pain or discouragement. Surgery, chemotherapy and radiation sickness, all contribute to the problem. Taste aberrations are more evident in patients with advanced disease and intensity is related to the tumour burden. Malnutrition results in general debility, reduction in immunocompetence and in wound healing, increase in drug toxicity and changes in psychological state resulting in apathy and depression.

b) Localized tumour effects: By far the most common causes of malnutri-

tion in this category are interference with food intake due to partial or complete obstruction of some portion of the gastrointestinal tract. Relief of the obstruction by surgical or other treatment is necessary to restore normal function. Nutrition support by tube feeding into a site distal to the obstruction or usually more effectively by intravenous alimentation may be very useful in sustaining such patients until normal oral feeding can be started.

Involvement of the pancreas, pancreatic duct or common bile duct by a malignant tumour impairs pancreatic and bile secretion and may lead to impaired digestion and absorption of fats and fat soluble vitamins and this soon leads to increased excretion of calcium and magnesium in the feces. Proteins are also likely to be much less efficiently absorbed. Pancreatic insufficiency may also be associated with impaired vitamin B-12 absorption. The use of parenteral vitamin K and other fat soluble vitamins also helps the restoration of patients to the best possible nutrition state for surgical procedure in such situations.

It is therefore obvious that there is as yet no clear evidence of the role of any dietary factor in the development and progression of neoplastic disease. Higginson has summarised the deliberations of a recent workshop conference on 'Nutrition in cancer causa-

tion and prevention' as follows: "In conclusion and excluding obvious bad habits such as excessive drinking, on the personal level, I would opt for a balanced diet with a modest amount of under nutrition in infancy, as having the strongest scientific base. I would recognise that 'balanced' and 'modest undernutrition' cannot readily be defined in terms of total health in humans or readily extrapolated from animal models"(65).

As nutrition is a life support system, the aggressive nutritional rehabilitation of a patient with cancer must be governed to a considerable extent by the nature of the prognosis. Medicated survival, particularly in the elderly is perhaps undesirable. Prolongation of life is only part of the goal, improvement of the quality of the remaining life has to be the major deciding factor.

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Malaria in Model Town, Lahore

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Since the malaria epidemic in Karachi 1967 urban malaria in Pakistan is given serious consideration. Blood surveys in cities of Karachi, Hyderabad, Faisalabad, Lahore and other cities have revealed reservoirs of malaria at several occasions.

Reported here are the results of blood and entomological surveys carried out by National Malaria Training

ed through our technician in September, 1985. He collected 27 slides of which 14 were found positive for malaria parasites.

Area-wise analysis indicated that positives were from Kot-Lakhpat Quarters, D.E.G. and K Block of Model Town, Lahore.

Table—I. Showing Date wise Slide Collection and Positivity at P.C.D. Post.

Date	Slides Collected	P.v.	P.f.	Tot. +ve	Area Positive.
8.9.85	10	4	2	6	Township (Naia Pul) E-Block.
10.9.85	8	2	2	4	Township, D-Block, Kotha Pind, K-Block.
22.9.85.	8	2	2	4	G-Block
23.9.85.	1	—	—	—	
TOTAL:-	27	8	6	14	51.85%

Centre (NMTC) in Model Town, Lahore during September, 1985.

Blood Surveys.

Initially one Passive Case Detection post in Model Town was activated

Thus we organized blood surveys and entomological surveys in Model Town, Lahore in last week of September.

1-2-3 Technical officers at Malaria Training Centre Lahore.

Results of Blood Surveys are given in the following Table.

Table-2. Total Slides Collected and Slide Positivity Rate

Area.	Slides Collected	P.v.	P.f.	Tot. +ve	% +ve.
Chiana Basti Opp: Chief Min, House.	215	24	4	28	13.02
K-Block.	35	3	1	4	11.42
E-Block.	67	0	1	1	1.49
A-Block.	1	1	0	1	—
D-Block..	5	5	0	5	—
TOTAL:-	323	33	6	39	12.07
P.C.D.*	27	8	6	14	51.85
GRAND TOTAL:-	350	41	12	53	15.14

* Brought forward from Table-1.

Entomology

Mosquito survey was conducted in these areas. Collected anopheline females were dissected for gut and glands. Only *An. stephensi* and *An. pulcherrimus* were captured in these areas. Density for both these species was low.

Two *An. stephensi* per man/hour and 0.5 *An. pulcherrimus* per man/hour by hand capture.

11 females of *An. pulcherrimus* dissected revealed nothing in gut or glands. However, two anopheline *stephensi* were found with oocysts in gut but none was positive for sporozoites. 43 *An. stephensi* were dissected in all.

Discussion

Kuchi Abadi accross the road, opposite the Chief Minister's House, harbours highest parasite load. Conditions here are quite condusive for the transmission of malaria. Similarly K-Block has the chances of transmission. Five cases detected from D-Block were the staff members of National Malaria Training Centre and one student residing in National Malaria Training Centre; case histories suggest that they contracted malaria locally. So, it appears malaria transmission of some degree is occuring in Model Town, Lahore.

Anopheles stephensi, in the past, has been found responsible for severe

malaria epidemics in Bombay (1908) (Christophers, 1949); Lucknow (1929) (Benerjee, 1930); Baghdad (1941) (Krishnan, 1961); and Karachi (1967) (Rehman and Muttalib, 1967). At all these occasions *Anopheles stephensi* was found involved in these episodes. It is therefore, absolutely necessary to keep a watch on this mosquito.

Considering the threat of malaria outbreak in Model Town, there is dire need of taking up following steps. In the coming possible transmission season (March, April, May and more especially August, September, October through mid November).

1. Community at large should be made aware of possible malaria risk in the area.
2. Self-protection measures like use of bed nets, mosquito repellants and screening of houses should be advocated.
3. During malaria season, case detection and treatment facilities should be strengthened.
4. Drug resistance (Shah and Mujtaba, 1985) and insecticide resistance of malaria vectors (WHO Technical Report Series 655, 1980) is known from the rural areas of Pakistan. So, these aspects should be reviewed in urban areas also and taken care of.

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HEALTH POLICY AND CHILD HEALTH

Dr. Mrs. Saeeda Rashid,*

Child has been the subject of study and research in different aspects of living in practically every country of the world. The developed countries, with more know-how and financial resources have given more time and energy in focusing attention on children and the developing countries are trying to catch up with them.¹ The reason for this attention is simple. The child of today will be the citizen of to-morrow and the future of a nation depends on the quality of its citizens.² One English Poet very aptly wrote:

"Not Gold but only Men can make,
People great and strong."

This idea is above challenge. As a Nation's strength lies in its men, and children of today are the men of to-morrow, therefore for building up of a strong and sturdy nation, a child of today should be carefully looked after especially in the field of health.³ A healthy child will grow up in a

healthy person and if the greater number of the people are healthy then the foundation of a strong and sturdy national is laid. Therefore the need for providing proper health cover to children can hardly be over-emphasied.

In Pakistan the children under the age of 15 years, constitute 44.6% of the total population of 77 million. The population of children has been on an increase as is evident from the previous census figures. It was 42.44% in 1961, 44.04% in 1972 and the present estimates are 44.6%. Out of these, one-third are below the age of 5 years. The infant mortality is estimated to be 105 per 1,000 live births. Maternal mortality is somewhere between 6-8. The crude death rate is estimated to be 14 per 1000.⁴ Most of the lives are lost due to the non-availability of elementary medical services to mothers and children. We need one M.C.H. Centre for every 5,000 population. In 1978, the population of

*

Pakistan was 75,620 thousands.⁵ Accordingly we need 15,000 Maternal and Child Health Centres. However, at present, we have only 858 M.C.H. Centres in the country. Out of these, 623 are located in urban and 235 in rural areas. Most of the M.C.H. centres are managed by Lady Health Visitors while a few are managed by Midwives. Originally they were intended to be managed by Lady Doctors. This situation has developed due to the non-availability of Lady Doctors but the Punjab Government, Department of Health, is making efforts to fill the vacant posts of Women Medical Officers in the Province to manage these as well as the Rural Health Centres.

M.C.H. Centres are operated by a number of agencies, in particular, the Provincial Health Departments, autonomous and semi-autonomous organizations and voluntary agencies. The numbers are as follows:

Public	=	295
Semi-Public	=	283
Private	=	280

		858

The aim and object of the establishment of M.C.H. Centres was to provide health facilities in preventive and curative field, to children and their mothers. A random 10% sample

survey of M.C.H. centres was undertaken in 1977-78. The main conclusions of the survey were:

19% of the centres were abandoned or temporarily closed for lack of trained staff; and

95% were within 3.2 km of other health facilities, with which they have no structural or functional linkage, neither do they have organized linkage with hospitals, health centres, or family welfare clinics; M.C.H. care is thus provided as an independent programme.⁶

The M.C.H. programme in theory, provides for an integrated primary health care project but the 1977-78 survey revealed, that very little continuous pre-natal, intranatal and post-natal care was provided. A vast majority of M.C.H. Centres did not maintain ante-natal records. Family Planning and immunization were provided only in exceptional circumstances, Dai training and supervision were carried out on a scale. Regular follow-up of the growth and development of registered children was insufficient or non-existent. Baby scales were often lacking. Very few centres were checking weight, blood pressure, haemoglobin and urine for albumin and sugar. Continuity of care was deficient. Only 2 to 3% persons used the M.C.H. attending Centres for infant care. Due to this

mal-functioning of the M.C.H. Centres, the Basic Health Services scheme has been devised in which the M.C.H. Centres of the Public sector will be integrated into the new three-tier structure.⁷ This integration will increase the efficiency of the M.C.H. Centres and the needs of the child and mother for health care can be better met.

The Fifth Five Year Plan in the Health Sector, provides for a target of increasing the number of Basic Health Units/sub-Centres, Dispensaries and M.C.H. Centres by 4,596. This will make a total number of such Centres in the country to 10,446 from 5850. This figure is still less than the requirements of the country of 15,000 Centres at the rate of one per 5,000 people. The rest of the Centres can be established in the next Five Year Plan.

In our country, the Health Policy is being formulated by the Government in their Five Year Plans. The latest plan, the Fifth Five Year Plan covers a period from 1978 through 1983. In this plan a new health policy has emerged which focuses attention, among other things, on the importance of mother and child. Its salient features are as follows:

a) A substantial shift from the previous doctor-oriented strategy for health service to a three-tier system consisting of doctors, para-medical or auxiliary staff and community

health workers. Auxiliary personnel can be utilized successfully to contribute to the quantitative delivery of medical care. The utilization of both the auxiliary and the professional together with adherence to the concept of referral and informal supervision, are necessary if both a quantitative and qualitative service is to be developed. The new strategy would be the central feature of the Plan for expansion of modern health coverage in rural areas;

b) A better balance would be achieved between the facilities available in the urban areas and those provided in the rural areas;

c) Substantial progress would be made in the integration of special programmes with the health services in a manner which does not jeopardise the fulfilment of the objectives of the special programmes;

d) There will be a shift in emphasis from curative to preventive measures and associated community development; and

e) While there will be rapid acceleration in output of para-medical and auxiliary staff, the expansion undertaken in higher medical education would be consolidated.

The implementation of the programmes envisaged in the Plan will imp-

rove the availability of facility to population from one hospital bed for 1,666 persons to 1,209, from one rural health centre for 191,333 population to 66,630, a basic health unit/dispensary and M.C.H. Centre from 13,128 to about 8,332 people, a doctor from 5,940 to 3,350, and a nurse from 17,860 to 9,600. The realisation of these targets will contribute to the improvement of the health of the population including children.⁸

The above-mentioned features which are being put into operation are expected to go a long way in providing better health facilities to the child and its mother. With child and mother getting better medical care, the foundations for a better and healthy nationhood are laid. Besides the Federal and Provincial Departments of Health, Voluntary health agencies are also playing a very significant role in contributing their share in the promotion of the health of the Nation.

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UREA CLEARANCE (GFR) IN TERMINAL PREGNANCY

Dr. Muhammad Akram,*

Abstract

Glomerular Filtration Rate (GFR) is a central feature of renal function. Various indirect techniques are employed to assess GFR in human beings specially during pregnancy. A serial study of changes in GFR in non-pregnant, terminal pregnant and post-puerperal women applying standard urea clearance was determined and compared with findings of other workers. GFR was found to be higher in the local non-pregnant women than those in the temperate countries. It has been observed in the present study that estimations of GFR by standard urea clearance are not different from that determined by endogenous creatinine clearance. Moreover the different patterns of GFR at different stages of pregnancy could be relevant to the management of pregnancy in our country.

Introduction

Determination of GFR is important in detecting renal disease, in monitor-

ing its course and in assessing response to therapy. It is especially employed as an aid in the management of pregnancies complicated with hypertension and acute toxemia.¹

It has been demonstrated that the study of renal function in human pregnancy is beset by many problems and technical problems occur even with the most meticulous methodology.² Nevertheless, for clinical use endogenous creatinine clearance (ECC) is widely used but GFR can also be indirectly estimated by urea clearance. Therefore, it was found of interest to estimate GFR by the urea clearance method in non-pregnant, pregnant and post puerperal local women and compare these data with GFR values determined by the 24-hours ECC. The only realistic way to investigate renal function is to perform serial studies on the same subjects during and after pregnancy. Such demanding work has only occasionally been performed, but if the principle is neglected, significant changes in functions may be missed altogether and erroneous conclusions

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may be drawn. This paper attempts to describe the changes that occur in GFR during human pregnancy i.e. in the terminal pregnant and post-puerperal women by standard urea clearance (SUC).

Materials and Methods

Urea was estimated in serum and urine by oxime method.³ Thiocyanic acid was used to catalyze the reaction i.e. heating urea with diacetyl monoxime and to improve the colour intensity.⁴ Since urea estimations were made on 24 hours urine collection, the urine flow rate (UFR) was less than 2 ml/min. Therefore, standard urea clearance was calculated by the following formula:—

$$C = \frac{U \sqrt{V}}{P}$$

C = Standard urea clearance.

U = Concentration of urea in urine.

p = Concentration of urea in serum.

V = Under-root of volume of urine excreted per minute.

A total number of sixty subjects were studied. Thirty non-pregnant women were randomly selected which served as the control group. Thirty pregnant women at the terminal stage i.e. 2–15 days before the expected date of delivery were selected and again approached 8–12 weeks after delivery for blood and urine

samples.

Results

The total urinary volume was significantly reduced in terminal pregnant women than in non-pregnant-women. The UFR was 0.75 ± 0.04 , 0.58 ± 0.03 and 0.69 ± 0.04 ml/min in non – pregnant, terminal pregnant and post-puerperal cases respectively (Table 1).

The GFR estimated by SUC was found to be significantly decreased ($P < 0.001$) in the terminal pregnant women. However, the GFR in post puerperal women had no significant difference when compared with pregnant women.

Discussion

A major problem that must be overcome in studying renal function is the wide variation in absolute values between individual subjects. In the non-pregnant stage this may be resolved to some extent by correcting data to standard body surface area of 1.73 sq.m. and thus by implication to standard kidney size.⁵ However, in pregnancy the surface area nomogram is no more applicable.⁶

The estimation of GFR during pregnancy by ECC is mentioned as the method of choice.⁷ However, urea clearance also provides good index of GFR when determined at higher urine flow rates.⁸ Moreover, the advantage of urea clearance is that when GFR is below 10 ml/min,

Table II. Comparison of standard urea clearance and endogenous creatinine clearance in non-pregnant, pregnant and post-puerperal women [means $\pm$ SE]

	Non-pregnant (n = 30)	Pregnant (n = 30)	Post-puerperal (n = 20)
	A ₁	A ₂	A ₃
GFR (Standard urea clearance, ml/min)	55.0 $\pm$ 3.6	33.3 $\pm$ 3.0	38.9 $\pm$ 3.2
	B ₁	B ₂	B ₃
*GFR (24-hours creatinine clearance, ml/min)	136.9 $\pm$ 4.5	91.3 $\pm$ 4.8	143.3 $\pm$ 3.1

A₁ vs A₂ (p < 0.001); A₁ vs A₃ (p < 0.001); B₁ vs B₂ (p < 0.001);

B₂ vs B₃ (p < 0.001).

*Akram et al.¹⁰

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then an accurate urea clearance estimated over a short collection period is close to the inulin clearance regardless of the rate of urine flow.⁹ Therefore it was considered imperative to select urea clearance and to compare it with ECC performed by other workers.

GFR was found to be higher (55.0 ± 3.6) when estimated by SUC in non-pregnant subjects. Other workers^{10, 11} have also reported higher GFR values in normal male and female Pakistanis (Table II). At terminal stage of pregnancy GFR was found to be 33.3 ± 3.0 which is significantly less than normal non-pregnant stage. This observation is in accordance with the findings of workers abroad who have also observed a fall in GFR in late pregnancy.^{12, 13} The mechanism involved was not investigated in this study, however, it may be due to some disturbance of glomerulo-tubular balance.¹³ It has been reported that pain and freight which are

commonly observed during pregnancy may have something to do with the alteration in GFR.¹⁴ Therefore, some undefined hormonal or biochemical influence may be responsible for a decrease in GFR at terminal stage of pregnancy.

In conclusion the data appears to indicate that GFR in pregnant women significantly fell down ($P < 0.001$) as compared with non-pregnant women. The GFR at post-puerperal stage was returning towards normal but had no significant difference from terminal pregnant stage. The cause of insidious or delayed return to normal level of GFR determined by urea clearance was not undertaken in the present study. To further establish, the GFR values at post-puerperal stage it is suggested that more elaborated studies should be carried out during different seasons of the year applying different techniques of estimation of GFR.

Table 1. Blood urea, urine urea, urine flow rate (UFR) and standard urea clearance (SUC), in non-pregnant, pregnant and post-puerperal women [means $\pm$ SE]

	Non-Pregnant (n = 30)	Pregnant (n = 30)	Post-puerperal (n = 20)
Blood urea, mg/100 ml	36.9 ± 2.0	28.7 ± 2.0	42.5 ± 2.0
Urine urea, mg/100 ml	2313 ± 383	1189 ± 100	2067 ± 208
UFR, ml/min	0.75 ± 0.04	0.58 ± 0.03	0.69 ± 0.04
SUC, ml/min	55.0 ± 3.6	33.3 ± 3.0	38.9 ± 3.2

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CHLOROQUINE - RESISTANT FALCIPARUM MALARIA IN PAKISTAN.

I.H. Shah* and S.M. Mujtaba * *

Abstract WHO in vivo extended field tests to monitor the response of falciparum strains to chloroquine, the tests were carried out in Sheikhpura (October – November 1981), Jhang (November – December, 1983), and Bahawalnagar districts (December 1983 – January 1984) for Punjab Province in Pakistan.

The number of cases selected and followed were 60, 60 and 33 in the districts of Sheikhpura, Jhang, and Bahawalnagar, respectively. The results showed that two cases were resistant at RI level in Sheikhpura, four were resistant at RI level in Jhang whereas 15 cases were resistant at RI level and one case at RII level in Bahawalnagar district. These findings underline the need for extensive monitoring to detect other resistant foci in order that efforts be implemented to eliminate such foci from the country.

INTRODUCTION

The development of chloroquine resistance in *Plasmodium falciparum* was first noted in Colombia, South America in 1960. At about the same

time, the presence of these resistant parasites was also reported from Thailand. Since then there has been an extensive spread of chloroquine-resistant falciparum malaria throughout South East Asia. Most recently, chloroquine resistance in strains of *P. falciparum* has been reported from some of the countries in East Africa¹. In India, the eastern states were the first to report resistance in 1973 but recently it has been reported from Uttar Pradesh, the most populous state of India⁽²⁾

Realizing the grave implication to the malaria control effort should chloroquine resistant malaria become established in Pakistan, the Directorate of Malaria Control (DOMC) launched an extensive programme beginning in 1974 to evaluate the response of local falciparum strains to chloroquine through the WHO extended in vivo (28 days) field test. In addition, in collaboration with WHO, 50 macro in vitro tests were also carried out during 1976. The results of these earlier tests showed that the falciparum strains evaluated were fully sensitive to chloroquine⁽³⁾

However, beginning in 1981 when *in vivo* extended field testing was intensified in the Sheikhpura district there have been significant changes in response of local strains of *P. falciparum* to a standard dose of chloroquine. This paper will describe the most recent *in vivo* assessments and the results observed.

MATERIAL AND METHODS

1. Dates of Evaluation and Study Site

Known foci of *falciparum* infections were selected in the three districts of Sheikhpura, Jhang and Bahawalnagar of the Punjab province. All three *falciparum* foci were detected by the malaria field workers through monthly rounds of active case detection. The names of selected villages in each district and the dates of the evaluations are as follows:

Date	District	Village
Oct, Nov, 1981	Seikhupura	Tarey Da Kot
Nov, Dec, 1983 December 1983)	Jhang	Laliana Chak-440
January, 1984)	Bahawalnagar	Mohammad Pur

The approximate location of each village is shown in the attached map (Fig. 1).

To minimize the possibility of reinfection, the *in vivo* tests were carried out during the low trans-

mission season, from November February.

2. Selection of Test Subjects

Mass blood surveys were carried out in each of the selected villages to detect *falciparum* cases. After staining with Giemsa, the slides were examined to select cases with more than 1000 asexual parasites per mm^3 of blood. Only in Bahawalnagar a few cases of lower parasite density were selected, but even in these, the parasite counts were well above the minimum of 100 asexual parasites/ mm^3 . Parasite density was determined by counting the parasites against at least 2000 leucocytes in the thick smear. By multiplying the parasite count by a factor of 4 assuming a WBC¹ count of 8000/ mm^3 for the average Pakistani, the parasite density/ mm^3 blood is approximated.

Sixty cases were evaluated in Sheikhpura and Jhang districts but only 33 cases were selected in Bahawalnagar district. The age and sex composition of the cases in each district is given in Table 1.

Table I - Age and Sex composition of test subjects in the villages of District Sheikhupura, Jhang and Bahawalnagar:

	Age Groups	Male	Female	Total
1. Tarey Da Kot SHEIKHUPURA	00 - 04 years	3	5	8
	05 - 09 years	15	5	20
	10 - 14 years	8	4	12
	> 15 years	3	17	20
	Total	29	31	60
2. Laliana Chak 440 JHANG	00 - 04 years	2	2	4
	05 - 09 years	10	11	21
	10 - 14 years	6	7	13
	> 15 years	7	15	22
	Total	25	35	60
3. Mohammad Pur BAHAWALNAGAR	00 - 04 years	4	3	7
	05 - 09 years	1	2	3
	10 - 14 years	2	2	4
	> 15 years	8	11	19
	Total	15	18	33

3. Administration of Chloroquine

Chloroquine was administered to the selected subjects according to weight. The standard dosage of 25 mg chloroquine (base)/kg body weight was administered as per the following schedule:

Day 0-10 mg/kg body weight.

Day 1-10 mg/kg body weight.

Day 2 5 mg/kg body weight

The patients were requested to take food before administration of chloroquine. Every dose of the drug was swallowed by the subjects in the presence of one of the team members. Thereafter, they were observed for another half an hour to exclude the possibility of vomiting.

Chloroquine tablets used in these

tests were either from Bayer, Germany, or Specia Paris, France, all formulated as 150 mg base per each uncoated tablet.

4. The Detection of Chloroquine in the Urine

To confirm absorption and excretion of chloroquine, urine samples were collected on day 2 from all test cases except females above 12 years of age and examined by the Dill Glazko method⁽⁴⁾. Pretreatment urine samples from all the subjects and post-treatment samples from females above the age of 12 were not requested due to the inherent public aversion for such a procedure.

5. Case Follow-up

Blood smears were prepared daily from each test subject beginning on the first day of medication (day 0) through day 3, then on day 5, 7, 10, 13, 16, 19, 22, 25 and 28. A smear was considered negative if parasites were not found after searching 100 fields of a thick blood smear.

6. Definition of Drug Response

The *in vivo* response of the falciparum infections studied was graded according to the following WHO criteria⁽⁵⁾:

S = Clearance of patient parasi-

taemia by day 7 with no recrudescence.

RI = Clearance of patient parasi-taemia by day 7 with recrudescence by day 28 or earlier.

RII No clearance of patient parasi-taemia by day 7 but parasi-taemia lower on day 7 than day 0.

RIII = No clearance of patient parasi-taemia by day 7; parasi-taemia higher on day 7 than day 0.

RESULTS

The results of the mass blood surveys to detect falciparum infection are shown in Table 2. As indicated, the prevalence of malaria was particularly high in Sheikhpura and Jhang districts, between 52% – 53% and lower in Bahawalngar district, only 11%.

1. SHEIKHUPURA DISTRICT

The examination of follow-up slides showed that all the blood smears became negative for asexual parasites within the first 7 days. However, asexual parasites returned in 2 cases, on day 28 and 13 respectively. A special follow-up survey of all the test subjects was carried out on 25-11-81. The results from the special survey

showed that 6 additional cases were also positive for asexual parasites.

2. JHANG DISTRICT

In the sixty cases selected in this district, all showed clearance of asexual parasitaemia within the first 7 days. However, asexual parasites recrudescenced in 4 cases, on follow-up days 16, 16, 10, and 16 respectively.

3. BAHAWALNAGAR DISTRICT

Initial clearance of asexual parasitaemia within 7 days was observed

in all the subjects except No. 16 (Table 3). This patient, a small 3 years old boy, had a persistence of patent parasitaemia throughout the first 7 days. By day 7 the asexual parasite density reached 471/mm³ of blood and the child developed fever again. Chloroquine at the dosage of 10 mg (base)/kg body weight per day was repeated for another 3 days. This dosage alleviated the symptoms of fever and asexual parasites finally disappeared from this blood smear 7 days following the second treatment on

Table 2 — Date-wise collection and microscopic results of initial screening survey in Sheikhupura, Jhang, and Bahawalnagar districts.

Date of survey	No. of Villages surveyed	No. of slides collected	Microscopic Results				Slide positivity rate
			P.f.	P.v.	Mix.	Total	

SHEIKHUPURA DISTRICT

17-10-81	1	58	11	4	1	16	27%
18-10-81	1	24	14	1	1	16	66%
19-10-81	1	108	53	7	6	66	61%
20-10-81	1	12	10	—	—	10	83%
Total		202	88	12	8	108	53%

JHANG DISTRICT

6-11-83	1	93	41	3	1	45	48%
7-11-83	1	87	45	2	1	48	55%
8-11-83	1	36	19	2	2	23	63%
9-11-83	1	58	25	2	—	27	46%
10-11-83	1	26	15	—	—	15	57%
Total		300	145	9	4	158	52%

BAHAWALNAGAR DISTRICT

21-12-83	1	59	—	1	—	1	
22-12-83	2	119	2	5	—	7	1.6%
23-12-83	4	131	1	3	—	4	5.8%
24-12-83	2	106	4	5	—	9	3.0%
25-12-83	4	96	9	1	1	11	8.4%
26-12-83	3	114	8	3	—	11	11.4%
27-12-83	3	114	—	3	—	3	7.6%
28-12-83	3	115	11	17	—	28	2.6%
29-12-83	1	199	12	24	1	37	18.0%
30-12-83	1	124	13	8	—	21	18.5%
31-12-83	1	60	2	3	—	5	16.9%
1- 1-84	1	46	5	3	1	9	8.3%
2- 1-84	1	46	4	4	—	8	19.5%
Total		1399	71	80	3	154	17.3%
							11.0%

Table 3 - Results of falciparum infections with RI or RII response to chloroquine (25 mg [base]) / kg over 3 days)

LOCALITY: Mohammad Pur				DISTRICT: Bahawalnagar										DATE: January 1984				Urine test	
Case No.	Age (year)	Weight (Kg)	TROPHOZOITES/mm ³ ON OBSERVATION DAY	ON OBSERVATION DAY															
				0	1	2	3	4	5	6	7	10	13	16	19	22	25		28
2	2½	10	10720	1304	39	0	0	0	0	0	0	0	0	0	0	2313	3972	8506	+ve.
3	32	61	2475	79	79	0	0	0	0	0	0	0	0	0	0	23	23	9783	+ve.
6	27	40	6417	143	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Not Done
8	2	8	1205	1062	79	A	0	0	0	0	0	0	0	0	0	0	3676	0	+ve.
9	6	12	943	166	0	0	0	0	0	0	0	0	0	0	0	4147	5057	1138	+ve.
15	20	60	5013	525	23	0	0	0	0	0	0	0	0	0	0	19497	1205	62	+ve.
17	6	15	14570	2207	102	0	0	0	0	325	5915	1353	0	0	0	5399	1139	135	Not done.
18	35	50	4119	165	0	0	0	0	0	0	A	A	0	0	0	0	204	292	+ve.
19	3	10	6061	291	31	0	0	0	0	0	471	5043	0	0	0	0	326	652	+ve.
20	25	50	1333	2682	196	0	0	0	0	0	0	0	0	0	0	15	7	6882	Not done.
22	25	43	351	87	15	0	0	0	0	0	0	0	0	0	0	9437	3293	3412	Not done.
24	30	34	11273	8047	829	0	0	0	0	0	0	958	0	0	0	0	1116	0	+ve.
26	29	53	1333	324	102	0	0	0	0	A	0	0	0	0	0	A	416	8629	+ve.
30	18	52	10343	492	1013	429	0	0	0	3	119	6747	0	0	0	0	6641	2833	+ve.
32	35	53	7491	4903	79	15	0	0	0	0	0	0	0	0	0	772	0	0	

day 13. In another 15 infections, recrudescence was observed between day 10 to day 28. The pattern of recrudescence in these 15 cases is as follows:

On observation day	Number of cases (recrudescence)
10	2
13	1
16	4
22	4

25
28
3
1

Detailed results of those cases showing RI and RII response are shown in Table 3.

A comparison of parasite density on day 0 and the average parasite clearance time (days) between the sensitive and RI infections is presented in Table 4.

Table 4 — The average parasite density on day 0 and average parasite clearance time in days in falciparum strains evaluated in Mohammad Pur, Bahawalnagar.

	Average Parasite density on day 0		Average Clearance time in days
	No. cases	Average density	
Sensitive cases	16	6490/mm ³	1.4 days
RI cases	16	5572/mm ³	1.8 days

The clearance time was somewhat longer in the resistant (RI) cases but other than this, no other differences were discernable between the two

types of cases.

A summary of the *in vivo* results observed in the 3 districts evaluated is presented in Table 5.

Table 5 — The *in vivo* response of falciparum strains to chloroquine from 3 districts of the Punjab.

District	Total No. of cases evaluated	Response (No. cases)			
		S	RI	RII	RIII
Sheikhupura	60	58	2	0	0
Jhang	60	56	4	0	0
Bahawalnagar	33	17	15	1	0

The day 2 urine samples were positive for chloroquine in all the subjects which showed recrudescence of ase-

xual parasitaemia in those whose urines were tested. This confirms the fact that the administered dose of

chloroquine was duly absorbed by these patients.

DISCUSSION

The development of chloroquine resistance by the falciparum parasite, similar to the acquisition of insecticide resistance by the vector, has created technical problems which have made malaria control much more difficult. Chloroquine is probably the most effective and safe anti-malarial known. The impact of chloroquine resistance varies according to the local epidemiologic and socio-economic factors. In areas with resources to implement a control programme, the emergence of chloroquine resistance coupled with the presence of an efficient exophilic vector, such as *Anopheles dirus* found in much of the jungle area of Southeast Asia, takes on added significance. In most of the African countries where the treatment of a clinical case with chloroquine is virtually the only practical mean to reduce mortality and morbidity due to falciparum infections, the development of resistance may be a harbinger of tragic events the equal of which has few parallels. In malarious areas where there is a functional control programme and where the vectors are still responsive to insecticides, the development of chloroquine resistance becomes significant only if the control effort deteriorates to a point in which the

transmission of falciparum malaria goes on unchecked.

Since the first report of chloroquine resistance in falciparum malaria from India in 1973⁽²⁾, the Malaria Control Programme of Pakistan has been well aware of the potential spread of such strains across the border. For this reason, studies were first undertaken beginning in 1974 in an attempt to detect the presence of the resistant strains as rapidly as possible.

We believe the results reported here establish with little doubt that strains of chloroquine resistant falciparum malaria are present in Pakistan. Whether a direct relationship exists between the prevalence of the resistant strains and proximity to the Indian border remains to be determined by future studies.

The question of separating patent parasitaemia in field studies, involving extended follow-up periods of one month, from those due to recrudescence and hence drug failure or due to reinfection, cannot be resolved with certainty. The fact that the studies were carried out during the low transmission season may provide some assurance but no guarantee that the recurrence of patent parasitaemia is due to drug failure. In the studies conducted in Sheikhpura and Jhang districts, the low number of RI

cases makes this discrimination especially difficult. In Bahawalnagar district, however, given the time of assessment, in January, when malaria transmission is at its lowest, and the high percentage of the cases demonstrating a recurrence of patent parasitaemia, the conclusion that chloroquine resistant parasites were indeed detected is one that is difficult to challenge.

The basic mechanism for the spread of the resistant strains is not precisely known. Epidemiologic evidence would indicate that the centrifugal spread from a focus by means of vector transmission is the most likely method for its spread. Also unknown is how the original phenomenon of resistance developed. One explanation is that of a recent mutation in the genes of individual parasites. Another mechanism, offered by Chin et al.(6) is that falciparum strains are composed of a heterogenous population with respect to the susceptibility to chloroquine; most of the parasites are inherently susceptible but a smaller population has always had the potential for resistance to chloroquine. They further postulated that, depending on the geographic origin of the strains, the proportion of the individuals with resistance potential may vary; in areas where the resistant population is high, the use of chloroquine would result in early selection and thus early emergence of resistant strains but, in

other areas where parasites with resistant potential are very low or are not present at all, the emergence of resistant strains most likely would require an introduction of resistant parasites from outside the area. An even more intriguing enigma is why none of the other species of human malarias, particularly *P. vivax*, has developed a similar resistance to chloroquine. Irrespective of how the resistant strains may have evolved, once they become established, the rapidity of their spread is dependent on the efficiency of the local vectors to transmit the resistant strains and/or on the intensity of malaria transmission. In areas with efficient vectors such as *A. dirus* in Southeast Asia or *A. gambiae* in Africa, the spread would predictably be rapid particularly in places with intense malaria transmission. In areas with less efficient vectors, such as *A. culicifacies* in Asia or *A. albimanus* in Latin America, the spread of chloroquine resistant strains should be much slower.

The Malaria Control Programme of Pakistan is planning to intensify the monitoring of chloroquine resistant falciparum malaria, relying primarily on the WHO micro *in vitro* method as a screening procedure. At the same time, steps are being taken to improve the efficiency and reliability of the surveillance methods and the efficiency of spray operations. The threat posed by the extensive spread of resis-

tant strains should not be minimized. The only method to curtail its spread is to control falciparum malaria transmission effectively. Towards this end, the full co-operation of every level of government as well as the community members living in malarious areas is required. Should the resistant strains be allowed to spread in Pakistan, the price to be paid by the citizens of Pakistan, an increase in mortality and morbidity due to falciparum infections, would be too high and totally unacceptable.

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ORAL HEALTH SITUATION ANALYSIS PAKISTAN.

Dr. J.J. Moller *

1. TERMS OF REFERENCE

In preparation for a Working Group Meeting on Oral Health (see ref. No. 13) an analysis of the oral health situation in a number of countries is being performed, to include data from surveys on oral health services, manpower and on development plans. Such situation analysis have already been performed in Egypt, Iraq, Oman, Saudi Arabia, Somalia, Sudan and Yemen Arab Republic (see ref. Nos. 4, 5, 6, 7, 14, 16, 20).

The terms of reference for these situation analysis are:

- A. to evaluate the oral health status of the population with particular reference to younger age groups.
- B. to assess existing oral health facilities.
- C. to assist the government in planning for expansion of oral health services.

2. APPROACH

In order to be able to make valid comparisons between the oral health status of the population groups examined and in order to be able to make recommendations which

would fit into a national as well as a regional oral health programme, the same approach has been used in all countries visited.

The basic components for the present situation analysis are thus:

- 1) a pathfinder survey.
- 2) a digest of clinical records.
- 3) the gathering of relevant data on health and oral health programmes, plans, facilities and manpower.
- 4) an interpretation of past and present surveys and other data and actions as they might relate to the development of a national oral health programme.

The pathfinder survey, using the combined oral health status and treatment assessment forms from the Oral Health Surveys Basic Methods (WHO 1977), was performed for 240 children aged 12 to 15 years (equal numbers of boys and girls). Due to various constraints it was only possible to examine children in the three major administrative areas: Karachi, Lahore and Islamabad. The

* Who - Consultant Regional Office for Oral Health Oral Health Unit, Who Eumro.

Table II. Anthropometric measurements of males and females belonging to different socio-economic groups (mean $\pm$ SD)

		17 - 20 years		21 - 30 years		Total	
		High	Low-middle	High	Low-middle	High	Low-middle
Number of subjects							
Male		366	110	371	155	737	265
Female		247	151	141	48	388	199
Height, cm							
Male		171.2 $\pm$ 6.6	167.2 $\pm$ 5.5	170.9 $\pm$ 5.3	167.8 $\pm$ 5.9	* 171.0 $\pm$ 6.0	* 167.5 $\pm$ 5.7
Female		158.6 $\pm$ 5.2	153.9 $\pm$ 8.9	* 158.6 $\pm$ 5.0	155.3 $\pm$ 7.9	* 158.6 $\pm$ 5.1	* 154.2 $\pm$ 8.7
Weight, kg							
Male		57.7 $\pm$ 8.4	54.8 $\pm$ 7.4	* 59.9 $\pm$ 8.5	59.0 $\pm$ 8.4	NS 58.8 $\pm$ 8.5	* 57.2 $\pm$ 8.2
Female		49.0 $\pm$ 7.0	46.8 $\pm$ 4.9	* 50.9 $\pm$ 6.4	50.1 $\pm$ 12.2	NS 49.7 $\pm$ 6.8	* 47.6 $\pm$ 7.5
Arm skinfold, mm							
Male		7.8 $\pm$ 3.5	7.3 $\pm$ 3.2	NS 8.4 $\pm$ 3.4	7.6 $\pm$ 3.9	8.1 $\pm$ 3.6	* 7.5 $\pm$ 3.6
Female		16.0 $\pm$ 5.7	15.8 $\pm$ 5.2	NS 16.5 $\pm$ 5.4	18.3 $\pm$ 6.5	16.2 $\pm$ 5.6	16.4 $\pm$ 5.7
Weight-to-height ratio							
Male		0.33	0.33	0.35	0.35	0.34	0.34
Female		0.31	0.30	0.32	0.32	0.31	0.31

* $P < 0.001$; $P < 0.01$; @ $P < 0.05$; $P < 0.02$ for comparison of high and low-middle socio-economic groups.

NS= not significant.

characteristics of the examination sites are illustrated in the following table:

Table I. Demographic data of study subjects

Economic status	High	Low-middle
Males		
Number	737	265
Age range(yr)	17-26	17-30
Mean age(yr) (s.d)	21.9(2.0)	22.5(4.0)
Females		
Number	388	199
Age range(yr)	17-25	17-28
Mean age(yr) (s.d.)	20.2 (1.6)	19.9(2.4)

A number of demographic and general health figures have been quoted from: Pakistan Data and Study Results (see ref. No. 18), and from all the persons mentioned under section 6 (Acknowledgements).

3. THE SITUATION ANALYSIS IN FIGURES

Table 1 provides a mainly numerical exposition of data and examination results from the two basic components of the approach.

4. SIGNIFICANCE OF THE SITUATION ANALYSIS FIGURES FOR ORAL HEALTH

4.1 Background

Pakistan is located between the

latitudes of 20°30' and 30°45' north and between the longitudes of 61° and 75°31' east.

It is a country of 76,967,000 people (mid-1978 estimate) with a total area of 795,791 sq.kilometers, and is comprised of six major physical divisions or regions. They are the (1) northern mountains; (2) western offshoots of the Himalayas; (3) Baluchistan plateau; (4) Potwar plateau and the Salt Range; (5) upper and lower Indus Plains; and (6) Thar desert.

Pakistan is a country of diversified land features. In the north, it is bounded by the Himalayan Ranges, the Karakoram Range, and the Hindu-kush beyond it. This is the area where

one finds the greatest number of peaks as compared to any area of its size in the world. Similarly Azad Kashmir is hilly with many snow peaked mountains.

The vast plain of Pakistan stretches from the Himalayas and Salt Range in the north to the Arabian sea in the south and contains the provinces of Sind and Punjab. This area is drained by the river Indus (and its tributaries) and includes certain desert belts. To the west lies Baluchistan, a mainly hilly plateau with cooler climate, dry valleys, and a great expanse of desert.

Pakistan is on the margin of monsoon climate. In the plains, temperature varies between 4°C – 14°C during

the winter and between 32°C – 46°C in the summer. Rainfall in the plains varies from 5" in upper Sind to 50" in the Himalayan sub-mountains. Mean annual rainfall is 31.8" in North Punjab, 19.2" at Lahore, and 7" in South Punjab and Sind.

The territory of Pakistan is made up of four provinces; Baluchistan, North West Frontier (N.W.F.P), Punjab and Sind. Of these, Baluchistan is the largest with an area of 134,050 sq.miles, followed by Punjab with an area of 79,634 sq.miles (including the Federal Capital). Sind has an area of 54,634 sq.miles, NWFP 28,773 sq.miles, and the Federally Administered Tribal Areas (FATA) cover 10,510 sq.miles.

The principal statistics are summarized as follows:

General

Total area	— 795,791 km ²
Population (estimated mid-1978)	— 76,967,000
Crud birth rate	— 42.6 per 1000
Crude death rate	— 13.0 per 1000 projected for 1978/79
Infant mortality	— 115 per 1000 live births
Growth rate	— 3%
Percentage population (Urban/Rural)	— Urban 28.94% Rural 0.06%
Population up to 15 years of age (0–14) as percentage of the total population	— 44.43%
Life expectation at birth	— Male 52.9 years Female 51.8 years
Total fertility per woman	— 6.00
Maternal mortality	— 6–8 per 1000 live births

The literacy rate is 21.7% (30.2 for males and 11.6 for females or 41.5 for urban areas and 14.3 for rural areas).

Pakistan has a federal system of government where the provinces enjoy considerable autonomy. "Health" is also the responsibility of the Provincial Government. Thus there is a Federal Ministry of Health and four Provincial Health Departments.

The Federal Health Ministry is responsible for laying down policies, maintenance of medical educational standards through the Pakistan Medical and Dental Council, international relations in the field of health, and administration of international health regulations. All assistance from organizations such as WHO, UNDP, UNICEF and other external sources is also channelled through the Federal Ministry of Health.

The Secretary of Health who was previously from the non-professional civil service is responsible to the Federal Minister of Health; now the Secretary is from the medical profession. He is also responsible for Population Planning and Social Welfare. The Director General of Health is responsible to the Secretary of Health.

The Ministers of Health of the provinces are political appointees. They are assisted by a Secretary of Health who is the technical head of

the department. The Directors of Health Services in each province work under the Provincial Health Secretary. DHS is responsible for the administration of almost the entire health establishment in the province. Only the medical colleges and some special institutions are directly under the Secretary.

In Punjab 43.9% of the hospitals are located in urban areas for 24.9% of the population. In Sind 58.2% of the hospitals are located in urban areas for 41.3% of the population. in NWFP 20.4% of the hospitals are located in urban areas for 13.9% of the population while in Baluchistan 20.5% of the hospitals are in urban areas for 16.7% of the population. Urban areas have more facilities than rural areas.

On an average, a hospital bed is available for 570 persons in urban areas whereas a similar facility is available for 9,190 persons in the rural areas.

The doctor/population ratio is 1/5940 and the dentist/population ratio 1/73,352.

There are four dental schools, namely:

- 1) de Montmorency College of Dentistry, Lahore, Punjab Province.
- 2) Dental Section, Liaquat Medical

College, University of Sind, Jamshoro, Sind Province.

3) Dental Section, Nishtar Medical College, Multan, Punjab Province.

4) Dental Section, Khyber Medical College, Peshawar, North West Frontier Province.

A 2-year postgraduate degree (MDS) is offered at the dental school in Lahore since 1975.

There are no schools for dental auxiliaries or dental laboratory technicians. There is an unknown number of non-professional indigenous practitioners (questionate more than 4,000).

4.2 Significance of Oral Disease Data

A pathfinder survey cannot be sure of identifying every variation in disease prevalence or severity and inevitably there remain some questions which can only be answered when a

more comprehensive survey is possible. However, the data seem to be sufficient for initial planning, and experience with other pathfinder surveys has shown that it is unlikely that a more detailed survey would reveal a situation materially different from what the pathfinder data have identified. Despite the problems of attaining a reasonable sample, the survey data collected are sufficient indicators for a low level of dental caries with very little difference between socio-economic groups.

The percentage of caries-free children varied from 23 to 30 per cent in Karachi, 30 to 33 per cent in Rawalpindi and 33 to 50 per cent in Lahore.

The DMF index for 12 year olds varied from 1.90 to 2.27 and for 15 year olds between 3.16 and 3.34.

Periodontal disease in children is at a low to moderate level by global standards. There was, however, a definite difference between Karachi I (high socio-economic level) and Lahore (low socio-economic level) as can be seen in the following table:

number of segments with				
12 year olds	deposits	calculus	gingivitis	advanced conditions
Karachi I	1.3	0.6	0.2	0
Lahore	2.9	1.6	0.5	0.1

These differences accent once more the fundamental association between periodontal conditions and oral hygiene, the latter being much closer to adequate in the high socio-economic group in Karachi.

The occurrence of destructive periodontal disease in adults seemed to be particularly severe in the low socio-economic groups.

No cases of dental fluorosis were found in the children examined. The prevalence and severity of dental fluorosis, however, has been found to be quite high in 1) Tharparkar and Sukkur in Sind Province and in Dera Ghazi Khan, Faisalabad, Multan and Sargodha in Punjab Province.

The percentages of children with dento-facial anomalies were found to be between 30 and 50 per cent with no distinct pattern related to age or socio-economic level. The most common anomalies were: distal occlusion, upper anterior spacing, lower anterior crowding and overjet. The treatment need is estimated to be 7 to 10 per cent.

4.3 . Significance of Data on Treatment and from other Sources

From the various data collected the salient features can be summarized as follows:

- 1) Most dental services are provided by private practitioners, government clinics and OPD's in most

hospitals.

- 2) There is no organized school dental service
- 3) There is an unknown number of non-professional indigenous practitioners
- 4) There is no formal training of dental auxiliaries
- 5) Most extractions in adults seem to be due to advanced periodontal disease, which is the major cause of tooth loss in adulthood.
- 6) Most disease seen was untreated in children as well as in adults. Fillings were only seen in children from the higher socio-economic groups (Karachi 1 and Rawalpindi)

5. INTERPRETATION AND RECOMMENDATIONS

5.1 INTERPRETATION

5.1.1 Oral Diseases

Dental caries

Dental caries is the major problem in the Pakistan oral health situation. Even though the prevalence and severity of dental caries is still at the lower level as compared to global standards there are indications that the disease is on the increase particularly in unbanized areas. Presumably the

diet has always tended towards sweet foods, but it is likely that the intensity of such foods and sweets is now even greater than before particularly in children.

The situation calls for prevention at a very high priority in most urban areas particularly by implementing school-based preventive programmes the basis of which should focus on practical toothbrushing exercises and dental health education. In some areas it might be justified to include fluoride rinsings in such a programme.

The most usual programme for application of fluorides at school is a rinsing programme. There are a number of different routines related to concentration and periodicity of the class activity. The routine that WHO uses as a standard is as follows:

Rinsing procedure

Each child should rinse his/her mouth once every second week (once a fortnight) according to the following table:

Age in years	Amount of solution in ml (cm ³)	Duration of rising in minutes
6-7	7	2
8-10	10	2.5
11-13	10	2.5

Practical performance of the rinsing

1. The children should take the full

amount of the solution (7 or 10 ml) in the mouth in one sip.

2. The solution should be swished thoroughly between the teeth by vigorous movements of the cheeks.

3. While rinsing the children should keep the chin down and the empty cup close to the mouth so that in case the child laughs or coughs the solution can be spat directly into the cup instead of being swallowed or spilt on the floor.

4. While the children are rinsing their mouths with the solution the instructor hygienist or teacher) should instruct the children on the importance of proper oral hygiene and the hazards related to a high consumption of fermentable carbohydrates.

5. After completion of the rinsing (2 or 2.5 minutes) the children are instructed to spit out the total amount of the solution into the cup.

6. If non-disposable cups are used they should be cleaned in water and stored in the classroom.

Preparation of the solution

One packet (~ 2 g. of NaF) is dissolved in 1 litre of ordinary tap water. Only in the case where the hardness of the water exceeds 30°DH, should distilled or less hard water be used. The solution prepared in this way contains 0.2% sodium fluoride (equivalent to 0.09% fluoride ion). The solution should be stored in polyethylene bottles (plastic bottles).

Periodontal diseases are also an important problem for the total population and call for a health education programme aimed at a change in behaviour towards consistent and better oral hygiene. Such a programme would be an integral part of the oral disease preventive programme in schools.

Even though the prevalence of dento-facial anomalies were found to be moderate to high, the present service coverage would only allow for the treatment of the most disfiguring cases.

See Recommendations, I, II, III

5.1.2. Oral Health Manpower Development

Dentists. At present there are 1,047 dentists in Pakistan equivalent to a dentist: population ratio of 1: 73, 352

However, most dentists are employed in more than one capacity so that there are many and complex

combinations of the actual deployment of the workforce. With the relatively small number of dentists in the country it is obvious that the output of dentists from the dental schools must be increased.

School Dental Nurses. There is no school dental nurse training in Pakistan. With the recent increase in dental caries among school children in the major cities the introduction of this type of auxiliary should be considered.

Other categories of dental auxiliaries. Training programmes for dental laboratory technicians and dental mechanics should be established.

See Recommendations Iv. V.

5.1.3 Development of Oral Health Services

Apart from the dental services provided in the out-patient departments in hospitals, in the dental schools and in the armed forces, there are no public dental services available for the population. For the majority of the population dental services are provided by private practitioners and indigenous practitioners on a fee for service basis.

The first step in the development of a dental public health service system would be to establish adminis-

trative units (department of oral health services) at federal as well as provincial levels. The second step would be to provide preventive services including oral health education programmes for specific target groups.

Oral health legislation regulations should be formulated to support the dental profession and the oral health service system.

5.1.4 Evaluation and Research

Monitoring of disease trends and evaluation will be essential for the overall programme. The evaluation should take place in 1984 and again in 1987.

The possibility of collaborative research in such areas as the effect of dietary habits on dental caries experience and on the ingestion and metabolism of fluorides and other research areas could be beneficial for a number of populations in the Eastern Mediterranean Region.

See Recommendations X, XI

5.2 RECOMMENDATIONS

Each recommendation in this section will relate to a goal. The recommendations will be grouped under relevant headings, numbered and cross referenced with items in section 5.1 Interpretation. Means of evaluating goal achievements will be stated at the

end of each group of recommendations.

5.2.1 Oral Disease Prevention

RECOMMENDATION I

Oral disease preventive programmes should be instituted for specific target groups (mother and child, preschool children and school children). The school-based programme should include daily toothbrushing drills with toothpaste (preferably fluoridated) or ordinary tap water.

Dental health education programmes should be developed for these target groups as well as for the population at large.

RECOMMENDATION II

A concerted effort should commence with the introduction of comprehensive school-based preventive programmes to educate school children, parents and teachers in adequate oral hygiene and nutritional practices consistent with oral health. Of particular importance is restriction in the consumption of sweet foods and drinks especially within or in the immediate environments of schools.

RECOMMENDATION III

Monitoring surveys, which can use the WHO pathfinder approach or the more comprehensive WHO methods dependent on resources, should be performed in 1984 and 1987, with the

goals of providing information vital to assessment of goal achievements and of identifying if there are increases in dental caries in areas not covered by the preventive programmes.

Implementation goals

- 1) Oral disease preventive programmes including toothbrushing exercises and oral health education activities to start in schools in Karachi, Lahore and other major cities by September 1980.
- 2) Training of school teachers to supervise the above-mentioned programmes in May and June 1980.
- 3) Regulations for restriction of the sale of sweets, sweet foods or drinks in or in the immediate environs of schools (start September 1980).
- 4) Monitoring of disease trends (oral health surveys) should be performed in 1984 and 1987.

Evaluation

Apart from the implementation goals, the evaluation in 1984 for school children will be:

- 1) that the prevalence of dental caries will not exceed 2.5 DMFT per child or not exceed the present level where the prevalence

of dental caries is lower than 2.5 DMFT.

- 2) that the oral hygiene status will be improved as compared to the pathfinder survey results (i.e. a reduction of soft deposits to a maximum of 2.0 segments at 12 years of age),
- 3) that the occurrence of gingivitis at 12 years of age will not exceed those found in the pathfinder survey,
- 4) that monitoring surveys be planned and executed as stated in Recommendation III.

5.2.2. Oral Health Manpower Development

RECOMMENDATION I

The interrelation of quality and quantity is extremely important. For the time being the following four-tier level of manpower should be adhered to:

- 1) Professionals (dentists and specialists).
- 2) School dental nurses.
- 3) Chairside assistants (with and without prevention responsibilities).
- 4) Dental technicians and dental

mechanics.

The training programme and the number of manpower produced should be calculated according to the recommendations found on pages 22-28 in Dr. Barmes' assignment report from Iraq in 1976 (see ref. No. 2). Detailed job description for each of the manpower categories should be formulated.

RECOMMENDATION V

However, with the expected increase in the prevalence of dental caries and an expected expansion of the school dental services it is proposed that one or more schools for dental nurses should commence in September 1982. In the meantime (September 1980 to July 1982) two or three Pakistani students should be sent for training at the New Cross School for Dental Auxiliaries in London, or one of the dental nurse schools in New Zealand. The graduates from any one of these schools should — after their return to Pakistan — function as tutors in the proposed schools for dental nurses in Pakistan in collaboration with teachers (dentists) from the Dental Schools or the Ministry of Health. The duration of the training should be two years and the intake of students should be as high as possible — (anywhere between 10 and 30 per school per year).

Implementation goals

Strengthening of oral health

manpower development in number and type according to recommendations IV and V.

Evaluation

Yearly situation reports on achievements related to number, type and distribution of oral health manpower.

5.2.3 Development of Oral Health Services

RECOMMENDATION VI

The programme for preventive dental health as outlined above calls for specific organizational readjustments so that the activities relating to the training of auxiliaries, use of fluorides, education and supervision of personnel are properly planned, coordinated, monitored and controlled. It would, however, be necessary to earmark appropriate assignments exclusively to undertake work for Dental Health. The following arrangements are proposed:

- 1) Provincial Director to organize plan and supervise.
- 2) Deputy Directors at Division level to coordinate and plan the work within the Division.
- 3) Assistant Director of Dental Health and Principal Dental Officers at District Level to

mechanics.

The training programme and the number of manpower produced should be calculated according to the recommendations found on pages 22-28 in Dr. Barmes' assignment report from Iraq in 1976 (see ref. No. 2). Detailed job description for each of the manpower categories should be formulated.

RECOMMENDATION V

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Implementation goals

Strengthening of oral health

manpower development in number and type according to recommendations IV and V.

Evaluation

Yearly situation reports on achievements related to number, type and distribution of oral health manpower.

5.2.3 Development of Oral Health Services

RECOMMENDATION VI

The programme for preventive dental health as outlined above calls for specific organizational readjustments so that the activities relating to the training of auxiliaries, use of fluorides, education and supervision of personnel are properly planned, coordinated, monitored and controlled. It would, however, be necessary to earmark appropriate assignments exclusively to undertake work for Dental Health. The following arrangements are proposed:

- 1) Provincial Director to organize plan and supervise.
- 2) Deputy Directors at Division level to coordinate and plan the work within the Division.
- 3) Assistant Director of Dental Health and Principal Dental Officers at District Level to

organize the working of school dental clinics.

- 4) He shall be assisted by Dental Officers in inspection evaluation and guidance.

RECOMMENDATION VII

The highest priority should be given to the establishment of a comprehensive school dental service system primarily served by school dental nurses and chairside assistants (with and without prevention responsibilities). The cornerstone of the school dental service should be the oral disease preventive programme as described on page 11 and 12.

RECOMMENDATION VIII

A study should be made by 1982 of how best to provide adequate referral and special care services as the school dental service develops and a detailed plan of extension of these services should be prepared for oral health care in industry and other institutions to maintain the benefits of the school dental service into adult life. Such a study and plan should state what services would be provided, where and when, and should include construction and manpower goals, as well as output of work indicators.

RECOMMENDATION IX

The recording and reporting system should be unified and developed to such an extent that it can be used for

monitoring, evaluation and adjustment of the services provided.

Implementation goals

- 1) Expansion of the school dental services to be increased in child coverage by at least 5 per cent per year.
- 2) Survey related to the feasibility of introducing a systematic type of basic oral health care for special target groups of adults (mothers and pre-school children, adults in factories, industry and other institutions) by 1982.
- 3) To develop and introduce an effective recording and reporting system by January 1981.

Evaluation

Yearly situation reports describing the progress and development of the programme.

5.2.4. Evaluation and Research

RECOMMENDATION X

Evaluation of the proposed activities and monitoring of disease trends are important parameters in the overall implementation and continuation of the programme.

RECOMMENDATION XI

Research protocols should be developed to study the research areas mentioned in section 5.1.4. This could be done in collaboration with

WHO (see section 5.3).

Implementation goals

- 1) Evaluation of the overall programme will be performed every years starting January 1981.
- 2) Investigation of the possibilities of performing the proposed research projects by July 1980.

Evaluation

- 1) Evaluation of implementation goal 1) will be by yearly situation reports of achievements of the various steps in the plan.
- 2) Evaluation of implementation goal 2) will be defined when the individual research protocols are prepared.

5.3 COLLABORATION WITH WHO

The following collaborative possibilities are described in order of and with reference to the recommendations in section 5.2:

- A. Assistance can be provided in the development of various types of oral disease preventive programmes (ref. Recommendation I).
- B. Assistance in the design of a curriculum for school dental nurses can be provided (ref. RECOMMENDATION IV, V).
- C. Oral epidemiological data summary

services can be performed free of cost at WHO, Geneva, provided standard WHO forms and methods are used. Actual assistance in surveys or calibration of examiners for more comprehensive types of

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