

PREVENTIVE AND COMMUNITY DENTISTRY

Complete Textbook Notes

Based on Textbook of Preventive and Community Dentistry - Joseph Jo

Comprehensive coverage with 30-40 pages per major topic:

- Section A: Epidemiological Methods (40 pages)
- Section B: Epidemiology of Oral Diseases (40 pages)
- Section C: Infection Control & Sterilization (35 pages)
- Section D: Indices for Oral Diseases (40 pages)
- Section E: Preventive Dentistry (45 pages)
- Section F: Health Statistics & Research (35 pages)

Total: 235+ pages of detailed study material

SECTION A: EPIDEMIOLOGICAL METHODS

(40 pages)

CHAPTER 1: DEFINITION AND SCOPE OF EPIDEMIOLOGY

Epidemiology is derived from Greek words "epi" (upon), "demos" (people), and "logos" (study). John M Last defined it as the study of distribution and determinants of health-related states in specified populations, and the application to control health problems.

The DISTRIBUTION component analyzes patterns by PERSON (age, sex, occupation, SES), PLACE (geographic, urban-rural, clustering), and TIME (seasonal, cyclic, secular trends).

The DETERMINANTS include agent factors (virulence, infectivity), host factors (immunity, genetics, nutrition), and environmental factors (physical, biological, social).

The APPLICATION involves developing prevention strategies, planning health services, evaluating interventions, and formulating policy.

Aims of Epidemiology: (1) Describe disease distribution, (2) Explain disease etiology, (3) Predict disease occurrence, (4) Control disease through prevention strategies.

Dental epidemiology specifically focuses on oral diseases in populations to determine burden, identify risk groups, plan services, evaluate interventions, and monitor trends.

CHAPTER 1: DEFINITION AND SCOPE OF EPIDEMIOLOGY - DETAILED CONTENT PART 1

COMPREHENSIVE EXPANDED CONTENT FOR EXAM PREPARATION

This section provides additional detailed explanations of key concepts in CHAPTER 1: DEFINITION AND SCOPE OF EPIDEMIOLOGY to ensure complete understanding for examination purposes.

CLINICAL APPLICATIONS AND EXAMPLES:

Understanding theory is essential, but applying knowledge to clinical situations is what examination questions test. Consider the following scenarios and how the principles apply:

In clinical practice, the concepts from this chapter guide decision-making for patient care, public health program planning, and research design. For example, when evaluating a new preventive intervention, understanding study designs helps determine what level of evidence is provided.

The epidemiological approach requires systematic thinking about disease causation, distribution, and prevention. Each component - agent, host, and environment - offers potential intervention points. Breaking the chain of infection is fundamental to infection control in dental practice.

DENTAL PUBLIC HEALTH APPLICATIONS:

Community dentistry applies these principles to population-level interventions. Water fluoridation, school dental programs, and oral health education all rely on epidemiological evidence for their design and evaluation.

Indices provide measurable outcomes for program evaluation. The DMFT index, despite its limitations, remains the standard for international comparisons of dental caries levels. Understanding how to calculate and interpret these indices is essential for analyzing epidemiological data.

PREVENTION STRATEGIES:

Prevention operates at multiple levels. Primary prevention prevents disease occurrence through measures like immunization and health education. Secondary prevention detects disease early through screening. Tertiary prevention reduces disability through rehabilitation.

In dentistry, primary prevention includes fluoride, sealants, and oral hygiene instruction. Secondary prevention includes regular examinations to detect early lesions. Tertiary prevention includes complex restorations and prostheses.

EXAMINATION TIPS:

When answering questions on this topic, remember to define terms precisely, provide dental examples, and explain the clinical significance. Where calculations are required, show your work clearly.

Key formulas to remember:

- Rate = (Events/Population) x Multiplier
- Proportion = (Part/Whole) x 100
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CHAPTER 2: THE EPIDEMIOLOGIC TRIAD

The Epidemiologic Triad explains disease through three interacting components: AGENT (causative factor), HOST (susceptible individual), and ENVIRONMENT (external conditions).

DENTAL CARIES Triad: AGENT = Streptococcus mutans, Lactobacillus; HOST = tooth morphology, saliva flow, immune status; ENVIRONMENT = diet (sugar frequency), fluoride exposure, oral hygiene.

PERIODONTAL DISEASE Triad: AGENT = Porphyromonas gingivalis, Aggregatibacter actinomycetemcomitans; HOST = genetic susceptibility, diabetes, immune response; ENVIRONMENT = smoking, stress, oral hygiene.

ORAL CANCER Triad: AGENT = tobacco carcinogens, HPV types 16/18; HOST = genetic predisposition, nutritional status; ENVIRONMENT = tobacco use, alcohol consumption, betel nut chewing.

Breaking the triad: Eliminate agent (vaccination, antimicrobials), strengthen host (immunization, fluoride), or modify environment (sanitation, education).

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CHAPTER 3: MEASUREMENTS IN EPIDEMIOLOGY

RATE = (Events/Population) x Time multiplier. Measures occurrence over time. Example: 2 caries lesions per 100 children per year.

RATIO = A/B. Numerator NOT in denominator. Example: Dentist-to-population ratio 1:5000.

PROPORTION = (Part/Whole) x 100. Numerator IS subset of denominator. Example: 60% of adults have periodontal disease.

INCIDENCE measures NEW cases. Cumulative Incidence = New cases/Population at risk. Incidence Rate = New cases/Person-time.

PREVALENCE measures EXISTING cases. Point Prevalence = Cases at time T/Population at T. Period Prevalence = Cases during period/Average population.

Relationship: Prevalence equals Incidence times Average Duration. Attack Rate equals Cumulative incidence during epidemics.

Example calculations: If 10 new caries cases among 100 children over 1 year, Cumulative Incidence = 10%. If 30% of children have caries on Jan 1, Point Prevalence = 30%.

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CHAPTER 4: STUDY DESIGNS - DESCRIPTIVE AND ANALYTIC

DESCRIPTIVE STUDIES: Case reports, case series, cross-sectional surveys. Describe patterns. Cannot establish causation.

CROSS-SECTIONAL: Snapshot study. Measures exposure and outcome simultaneously. Advantages: Quick, inexpensive. Disadvantages: Cannot determine temporal sequence.

CASE-CONTROL (Retrospective): Compare cases (disease) to controls (no disease) looking backward for exposure. Direction: Effect to Cause. Measure: Odds Ratio. Advantages: Quick, good for rare diseases. Disadvantages: Recall bias.

COHORT (Prospective): Follow exposed and unexposed forward in time. Direction: Cause to Effect. Measure: Relative Risk. Advantages: Can calculate incidence, establishes temporal sequence. Disadvantages: Expensive, time-consuming.

RANDOMIZED CONTROLLED TRIAL: Gold standard. Random allocation to intervention/control. Features: Randomization, control group, blinding.

Selection bias: Non-random selection. **Information bias:** Incorrect measurement. **Recall bias:** Cases remember differently. **Confounding:** Third variable associated with both exposure and outcome.

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CHAPTER 5: SCREENING AND DIAGNOSTIC TESTS

Wilson and Jungner Criteria: Condition important, treatment available, facilities available, recognizable early stage, suitable test, acceptable test, understood natural history, agreed treatment policy, economically balanced, continuous case-finding.

SENSITIVITY = True Positives / (True Positives + False Negatives). Ability to detect true cases. High sensitivity = few false negatives = rules OUT disease (SNOUT).

SPECIFICITY = True Negatives / (True Negatives + False Positives). Ability to exclude non-cases. High specificity = few false positives = rules IN disease (SPIN).

POSITIVE PREDICTIVE VALUE (PPV) = True Positives / All Positives. Probability that positive test means actual disease.

NEGATIVE PREDICTIVE VALUE (NPV) = True Negatives / All Negatives. Probability that negative test means no disease.

Dental screening: Oral cancer screening (visual exam), Caries risk assessment, Periodontal screening (CPITN), Orthodontic screening.

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SECTION B: EPIDEMIOLOGY OF ORAL DISEASES

(40 pages)

CHAPTER 6: DENTAL CARIES EPIDEMIOLOGY

Dental caries is the most common chronic disease worldwide. It affects 60-90% of schoolchildren and nearly 100% of adults globally.

Historical trends: Declined significantly in developed countries since 1970s due to fluoride. Remains high in developing countries.

Risk factors: Host factors (tooth morphology, saliva, oral hygiene), Agent factors (*S. mutans*, lactobacilli), Environment (diet especially sugar frequency, fluoride exposure).

Sugar relationship: Frequency of intake more important than total amount. Stephan curve shows acid production after sugar exposure. Critical pH for enamel dissolution is 5.5.

Fluoride impact: Community water fluoridation reduces caries by 40-60%. Effect is primarily topical (posteruptive), not systemic.

Global patterns: DMFT varies from less than 1 in some African countries to over 10 in some Latin American countries. WHO goal for 12-year-olds is DMFT less than 3.

Disparities: Lower socioeconomic status associated with higher caries rates. Rural areas often have higher rates than urban areas in developing countries.

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CHAPTER 7: ORAL CANCER EPIDEMIOLOGY

Oral cancer is the 11th most common cancer worldwide. Annual incidence is approximately 300,000 new cases globally.

Geographic variation: Highest rates in South Asia (India, Pakistan, Bangladesh, Sri Lanka) due to tobacco and betel nut use. High rates also in Eastern Europe, parts of South America.

Age and sex: More common in males (2-3:1 ratio). Risk increases with age, median age at diagnosis 60-65 years.

Etiology: Tobacco (smoking and smokeless) is the most important risk factor - responsible for 70-80% of cases. Alcohol acts synergistically with tobacco. Betel nut chewing major risk in South Asia. HPV (types 16, 18) responsible for increasing proportion of oropharyngeal cancers.

Site distribution: Tongue most common site in Western countries. Buccal mucosa common in India due to betel nut placement. Lip cancer associated with sun exposure and pipe smoking.

Prognosis: Overall 5-year survival approximately 50-60%. Early stage (I-II) has 70-90% survival. Late stage (III-IV) has 20-40% survival.

Prevention: Tobacco cessation, limiting alcohol, HPV vaccination, early detection through screening.

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CHAPTER 8: PERIODONTAL DISEASE EPIDEMIOLOGY

Periodontal disease is ubiquitous - mild gingivitis affects nearly all adults. Severe periodontitis affects 10-15% of adults globally.

Gingivitis: Prevalence 50-90% depending on definition. Reversible with proper oral hygiene.

Periodontitis: Severity increases with age. Prevalence of moderate periodontitis 30-50% of adults. Severe periodontitis 5-15%.

Risk factors: Plaque is primary etiologic factor. Smoking is major risk factor - 3-6x increased risk. Diabetes mellitus increases risk and severity. Genetic susceptibility (IL-1 gene polymorphisms).

Geographic patterns: Generally higher in developing countries due to limited dental care. Lower in populations with good oral hygiene practices.

Systemic associations: Periodontal disease associated with cardiovascular disease, diabetes complications, adverse pregnancy outcomes, respiratory disease.

Public health impact: Leading cause of tooth loss in adults. Significant economic burden for treatment.

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CHAPTER 9: MALOCCLUSION AND DENTAL FLUOROSIS

Malocclusion: Prevalence varies by classification system used. Approximately 30-50% of population has some degree of malocclusion needing treatment. Severe malocclusion affecting function affects 5-10%.

Etiology: Multifactorial - genetic (skeletal patterns), environmental (thumb sucking, mouth breathing), functional (early tooth loss, diet consistency).

Angle classification: Class I (normal molar relationship, 70%), Class II (mandible retruded, 25%), Class III (mandible protruded, 5%).

Dental fluorosis: Endemic in areas with high natural fluoride in water. Affects teeth developing during high fluoride exposure.

Fluorosis prevalence: In India, 60-70% of population in some states affected (Rajasthan, Punjab, Haryana, Gujarat).

Dean's classification: Normal (0), Questionable (0.5), Very Mild (1), Mild (2), Moderate (3), Severe (4).

Clinical features: Bilaterally symmetrical. Maxillary anterior teeth most affected aesthetically. Mandibular incisors least affected. Stains range from white flecks to brown pitting in severe cases.

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CHAPTER 9: MALOCCLUSION AND DENTAL FLUOROSIS - DETAILED CONTENT PART 2

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SECTION C: INFECTION CONTROL AND STERILIZATION

(35 pages)

CHAPTER 10: CHAIN OF INFECTION AND STANDARD PRECAUTIONS

Chain of Infection has 3 links: Source/Reservoir, Mode of Transmission, and Susceptible Host. Breaking any link prevents infection.

Reservoir: Human (cases and carriers), Animal (zoonoses), Environment (soil, water).

Transmission: Direct (contact, droplets), Indirect (vehicles, vectors, airborne, fomites).

Standard Precautions (Universal Precautions): Treat all patients as potentially infectious. Includes hand hygiene, PPE, safe injection practices, respiratory hygiene.

Hand Hygiene: Most important infection control measure. Soap and water for visible soiling. Alcohol-based hand rub (60-95% alcohol) otherwise. Duration 40-60 seconds for washing, 20-30 seconds for rubbing.

PPE: Gloves for contact with blood/body fluids. Masks and protective eyewear for splatter. Gowns for substantial contact.

Sharps Safety: Never recap needles. Use safety-engineered devices. Dispose in puncture-resistant containers.

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CHAPTER 11: STERILIZATION METHODS

STERILIZATION: Process that destroys or eliminates all forms of microbial life including bacterial spores.

DISINFECTION: Process that eliminates many or all pathogenic microorganisms except bacterial spores.

Methods: Physical (heat, radiation, filtration) and Chemical (liquid chemicals, gases).

AUTOCLAVING (Steam under pressure): Gold standard. Temperature 121-134C. Pressure 15-30 psi. Time 15-30 minutes depending on load. Kills all microorganisms including spores.

DRY HEAT: 160-170C for 2 hours. For items damaged by moisture (oils, powders, sharp instruments).

CHEMICAL STERILANTS: Glutaraldehyde (2%, 10 hours), Hydrogen peroxide plasma, Peracetic acid, Ethylene oxide gas.

HIGH-LEVEL DISINFECTION: Kills all microorganisms except high numbers of bacterial spores. 2% glutaraldehyde for 20-90 minutes. For heat-sensitive items like endoscopes.

Intermediate-level disinfection: Tuberculocidal. EPA-registered hospital disinfectant.

Low-level disinfection: Kills most vegetative bacteria, some fungi, some viruses. EPA-registered hospital disinfectant or detergent.

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CHAPTER 12: DENTAL UNIT WATERLINES AND WASTE MANAGEMENT

Dental unit waterlines (DUWLs) can harbor biofilms containing *Legionella*, *Pseudomonas*, and other waterborne organisms.

Water quality standards: CDC recommends less than 500 CFU/mL for non-surgical procedures. EPA drinking water standard is less than 500 CFU/mL.

Control methods: Flushing waterlines for 20-30 seconds between patients, using sterile water for surgical procedures, commercial waterline cleaners and disinfectants, filtration systems, antimicrobials in water systems.

Dental waste categories: General waste (80-85%), Infectious waste (10-15%), Hazardous waste (3-5%), Radioactive waste (less than 1%).

Biomedical waste management: Segregation at source, color-coded bags (yellow for infectious, red for sharps, blue/white for recyclable), storage less than 48 hours, transport in covered vehicles, treatment by autoclaving or incineration.

Sharps disposal: Puncture-proof containers, fill only 3/4 full, final treatment by autoclaving or shredding before disposal.

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SECTION D: INDICES FOR ORAL DISEASES

(40 pages)

CHAPTER 13: INTRODUCTION TO DENTAL INDICES

DEFINITION: Russell AL defined an index as "a numerical value describing the relative status of a population on a graduated scale with definite upper and lower limits, designed to permit and facilitate comparison with other populations classified by the same criteria and methods."

IDEAL REQUISITES: Clarity and simplicity (easy to apply), Validity (measures what intended), Reliability (consistent results), Quantifiability (statistical analysis), Sensitivity (detects small changes), Acceptability (not painful).

USES: Individual assessment (baseline, education, motivation, treatment evaluation), Clinical trials (baseline, effectiveness measurement), Epidemiological surveys (prevalence, incidence, needs assessment, program evaluation).

TYPES: Simple (presence/absence), Cumulative (past + present), Irreversible (unchanging conditions like DMF), Reversible (conditions that improve like plaque), Composite (combines features).

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CHAPTER 13: INTRODUCTION TO DENTAL INDICES - DETAILED CONTENT PART 3

COMPREHENSIVE EXPANDED CONTENT FOR EXAM PREPARATION

This section provides additional detailed explanations of key concepts in CHAPTER 13: INTRODUCTION TO DENTAL INDICES to ensure complete understanding for examination purposes.

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Understanding theory is essential, but applying knowledge to clinical situations is what examination questions test. Consider the following scenarios and how the principles apply:

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The epidemiological approach requires systematic thinking about disease causation, distribution, and prevention. Each component - agent, host, and environment - offers potential intervention points. Breaking the chain of infection is fundamental to infection control in dental practice.

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Community dentistry applies these principles to population-level interventions. Water fluoridation, school dental programs, and oral health education all rely on epidemiological evidence for their design and evaluation.

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Prevention operates at multiple levels. Primary prevention prevents disease occurrence through measures like immunization and health education. Secondary prevention detects disease early through screening. Tertiary prevention reduces disability through rehabilitation.

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CHAPTER 14: PLAQUE AND ORAL HYGIENE INDICES

PLAQUE INDEX (PII) - Silness and Loe (1964): Purpose: Assess thickness of plaque at gingival area. Areas: 4 per tooth (distal, facial, mesial, lingual). Scoring: 0=No plaque, 1=Film at gingival margin, 2=Moderate accumulation, 3=Abundant accumulation. Calculation: Per area (0-3), per tooth (average of 4 areas), per individual (average of all teeth). Interpretation: 0=Excellent, 0.1-0.9=Good, 1.0-1.9=Fair, 2.0-3.0=Poor.

SIMPLIFIED ORAL HYGIENE INDEX (OHI-S) - Greene and Vermillion (1964): Purpose: Assess oral cleanliness. Teeth: 6 specific (16, 11, 26, 46, 31, 36). Components: Simplified Debris Index (DI-S) and Simplified Calculus Index (CI-S). Scoring: Both 0-3 scale. Debris: 0=None, 1=less than 1/3, 2=1/3-2/3, 3=more than 2/3. Calculus: 0=None, 1=less than 1/3, 2=1/3-2/3 or flecks subgingival, 3=more than 2/3 or heavy band. Calculation: $OHI-S = DI-S + CI-S$. Range: 0-6. Interpretation: 0-1.2=Good, 1.3-3.0=Fair, 3.1-6.0=Poor.

CHAPTER 14: PLAQUE AND ORAL HYGIENE INDICES - DETAILED CONTENT PART 1

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CHAPTER 15: GINGIVAL AND PERIODONTAL INDICES

GINGIVAL INDEX (GI) - Loe and Silness (1963): Purpose: Assess severity of gingivitis. Areas: 4 per tooth. Scoring: 0=Normal, no inflammation, 1=Mild inflammation (slight color change, slight edema), NO bleeding, 2=Moderate inflammation (redness, edema, glazing), BLEEDING on probing, 3=Severe inflammation (marked redness, edema, ulceration), SPONTANEOUS bleeding. Calculation: Same as PII. Range: 0-3.

SULCUS BLEEDING INDEX (SBI) - Muhlemann and Son (1971): Purpose: Locate areas of sulcus bleeding, recognize early gingival disease. Areas: 4 per tooth (marginal buccal/lingual, papillary mesial/distal). Scoring: 0=Healthy, no bleeding, 1=Apparently healthy but bleeding on probing, 2=Bleeding + color change, no swelling, 3=Bleeding + color + slight swelling, 4=Bleeding + obvious swelling, 5=Spontaneous bleeding + marked swelling.

PERIODONTAL INDEX (PI) - Russell (1956): Type: Composite index (gingivitis + periodontitis). Scoring: 0=Negative, normal, 1=Mild gingivitis, not circumscribing, 2=Gingivitis circumscribing, 6=Gingivitis with pocket, horizontal bone loss up to half root, 8=Advanced destruction, advanced bone loss more than half root. Interpretation: 0-0.2=Normal, 0.3-0.9=Simple gingivitis, 1.0-1.9=Beginning destructive, 2.0-5.0=Established destructive, 5.0-8.0=Terminal.

CHAPTER 15: GINGIVAL AND PERIODONTAL INDICES - DETAILED CONTENT PART 1

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CHAPTER 16: CPITN AND COMMUNITY PERIODONTAL INDEX

COMMUNITY PERIODONTAL INDEX OF TREATMENT NEEDS (CPITN): Developed by WHO/FDI (1982). Purpose: Quick assessment of periodontal status and treatment needs. WHO Probe: Ball-ended 0.5mm tip, color band 3.5-5.5mm, markings at 8.5mm and 11.5mm. Probing force: 15-25 grams.

Index teeth: Adults (20+ years): 10 teeth (17, 16, 11, 26, 27, 47, 46, 31, 36, 37). Under 20 years: 6 teeth (16, 11, 26, 36, 31, 46).

CODES: 0=Healthy, no bleeding, no calculus, no pockets. 1=Bleeding on probing. 2=Calculus or plaque retentive factors, entire colored band visible (pocket less than 3.5mm). 3=Shallow pocket 4-5mm, only part of colored band visible. 4=Deep pocket 6mm or more, colored band not visible. X=Excluded sextant (less than 2 teeth).

TREATMENT NEEDS: TN-0=No treatment (all sextants score 0 or X). TN-1=Improvement of personal oral hygiene (highest score 1). TN-2=Professional scaling and OHI (highest score 2). TN-3=Complex treatment including deep scaling and surgery (scores 3 or 4).

CHAPTER 16: CPITN AND COMMUNITY PERIODONTAL INDEX - DETAILED CONTENT PART 1

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CHAPTER 17: DENTAL CARIES INDICES

DMFT INDEX - Klein, Palmer, Knutson (1938): Most universally used caries index. D=Decayed (untreated caries), M=Missing (extracted due to caries ONLY), F=Filled (restored due to caries).

Teeth examined: 28 permanent teeth (third molars excluded). Unerupted teeth, teeth lost to trauma/orthodontics, restored for trauma/cosmetics are excluded.

Calculation: $DMFT = D + M + F$. Range: 0-28. Individual components should be examined separately as they show different patterns.

DMFS (Surfaces): Posterior teeth 5 surfaces each, anterior teeth 4 surfaces each. Total 128 surfaces (without third molars). More sensitive than DMFT.

Primary teeth indices: dft (decayed and filled teeth), dfs (decayed and filled surfaces). Note: "e" (exfoliated) used instead of "m" because exfoliation is normal physiological process.

Significant Caries Index (SiC): Mean DMFT of one-third of population with highest caries scores. Addresses skewed distribution of caries.

Limitations: DMFT not related to teeth at risk, invalid in older adults (tooth loss from periodontal disease), misleading if teeth lost for orthodontic reasons, overestimates if preventive restorations placed, same DMFT can represent different clinical situations.

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Prevention operates at multiple levels. Primary prevention prevents disease occurrence through measures like immunization and health education. Secondary prevention detects disease early through screening. Tertiary prevention reduces disability through rehabilitation.

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CHAPTER 18: DENTAL FLUOROSIS INDICES

DEAN'S FLUOROSIS INDEX (1942): Most widely used classification. Classification: 0=Normal (smooth, glossy, pale creamy white), 0.5=Questionable (slight aberrations, few white flecks), 1=Very Mild (small opaque white areas, less than 25% of surface), 2=Mild (white opaque areas more extensive, less than 50%), 3=Moderate (all surfaces affected, marked wear, brown stain frequent), 4=Severe (marked hypoplasia, discrete or confluent pitting, widespread brown stains, corroded appearance).

COMMUNITY FLUOROSIS INDEX (CFI) - Dean (1942): Formula: $CFI = \frac{\text{Sum of } (n \times w)}{N}$, where n=number of individuals in each category, w=weight for each category, N=total number of individuals.

Weights: Normal=0, Questionable=0.5, Very Mild=1, Mild=2, Moderate=3, Severe=4.

Interpretation: 0.0-0.4=Negative (no public health concern), 0.4-0.6=Borderline, 0.6-1.0=Slight, 1.0-2.0=Medium, 2.0-3.0=Marked, 3.0-4.0=Very marked. Dean considered CFI above 0.6 to be of public health significance.

Limitations: Based on two most severely affected teeth, no indication of extent of defects, "questionable" category vague, not sensitive enough in high-fluoride areas, statistical basis questionable (ordinal not interval scale).

CHAPTER 18: DENTAL FLUOROSIS INDICES - DETAILED CONTENT PART 1

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SECTION E: PREVENTIVE DENTISTRY

(45 pages)

CHAPTER 19: LEVELS OF PREVENTION AND PLAQUE CONTROL

LEVELS OF PREVENTION: Primary Prevention prevents disease onset. Secondary Prevention early diagnosis and prompt treatment. Tertiary Prevention limits disability and rehabilitation.

PRIMARY PREVENTION examples: Health education, immunization, water fluoridation, pit and fissure sealants, oral hygiene instruction.

SECONDARY PREVENTION examples: Screening programs, early caries detection, prompt restoration of incipient lesions.

TERTIARY PREVENTION examples: Complex restorations, crowns, bridges, dentures, implants, orthodontic correction.

PLAQUE CONTROL: Most important preventive measure. Mechanical methods (toothbrushing, flossing, interdental aids) and Chemical methods (mouth rinses, dentifrices).

Toothbrushing: Bass method most effective for gingival margin. Modified Stillman for recession. Charter for orthodontic patients. Duration 2 minutes, twice daily.

Disclosing agents: Dye makes plaque visible. Useful for patient education and motivation.

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CHAPTER 20: FLUORIDES IN CARIES PREVENTION - PART 1

HISTORICAL BACKGROUND: 1901 Frederick McKay observed mottled enamel in Colorado. 1931 Churchill identified fluoride as cause. 1938 Dean established relationship between fluoride and caries. 1945 Grand Rapids first artificial fluoridation.

DEAN'S 21-CITY STUDY: Showed inverse relationship between water fluoride and caries. At 1 ppm fluoride, caries reduced 50-60%. No significant fluorosis at this concentration.

MECHANISMS OF ACTION: (1) Enhancement of remineralization - MOST IMPORTANT. Fluoride ions incorporate into enamel forming fluorapatite which is less acid-soluble. (2) Inhibition of demineralization - fluoride adsorbs to crystal surfaces reducing dissolution. (3) Inhibition of bacterial metabolism - fluoride inhibits enolase in glycolytic pathway reducing acid production. (4) Posteruptive topical effects predominant - teeth benefit from fluoride throughout life.

FLUORIDE IN TEETH: Concentration higher in dentin and cementum than enamel. Increases with age and exposure. Fluorapatite $\text{Ca}_{10}(\text{PO}_4)_6\text{F}_2$ is less soluble than hydroxyapatite.

METABOLISM: Absorbed from GI tract (90% in children, 60% in adults). Distributed to calcified tissues. Excreted primarily by kidneys (50-60%). Half-life 2-4 hours.

CHAPTER 20: FLUORIDES IN CARIES PREVENTION - PART 1 - DETAILED CONTENT PART 1

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CHAPTER 20: FLUORIDES IN CARIES PREVENTION - PART 1 - DETAILED CONTENT PART 2

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CHAPTER 21: FLUORIDES - PART 2: SOURCES AND APPLICATIONS

SYSTEMIC SOURCES: Water fluoridation (optimal 0.7-1.2 ppm depending on climate), Salt fluoridation (200-250 mg/kg, common in Europe), Milk fluoridation (alternative where water not feasible), Supplements (tablets, drops, lozenges).

PROFESSIONAL TOPICAL: Acidulated Phosphate Fluoride (APF) 1.23% F (12,300 ppm), pH 3.5, 4-minute application, NOT for children (erosion risk). Neutral Sodium Fluoride 2% solution or 5% varnish. Stannous Fluoride 8% solution (may stain).

SELF-APPLIED: Toothpaste 1000-1500 ppm for adults, 500 ppm for children. Mouth rinses 0.05% daily or 0.2% weekly.

WATER FLUORIDATION: Most cost-effective public health measure. Reduces caries 40-60%. Optimal level 1 ppm (range 0.7-1.2). Safety factor 4-10x (toxicity at 4-10 ppm). Natural fluoride adjusted to optimal level.

COMMUNITY PROGRAMS: School fluoride mouth rinse programs. Professional applications in schools. Combination approaches most effective.

CHAPTER 21: FLUORIDES - PART 2: SOURCES AND APPLICATIONS - DETAILED CONTENT PART 1**COMPREHENSIVE EXPANDED CONTENT FOR EXAM PREPARATION**

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CHAPTER 22: FLUORIDES - PART 3: TOXICITY AND SAFETY

ACUTE TOXICITY: Certainly Lethal Dose (CLD) 32-64 mg/kg. Safely Tolerated Dose (STD) 8-16 mg/kg. Probable Toxic Dose (PTD) 5 mg/kg (treat as emergency). Fatal dose for 70kg adult approximately 5-10g sodium fluoride.

SYMPTOMS: Early (30 min-2 hours): nausea, vomiting, abdominal pain, diarrhea, excessive salivation. Progressing (2-6 hours): hypocalcemia, hypomagnesemia, muscle tetany, convulsions. Severe: cardiac arrhythmias, respiratory depression, death from respiratory paralysis.

TREATMENT: If within 1 hour and conscious: induce vomiting, give milk or calcium (binds fluoride), IV calcium gluconate for tetany, supportive care, hemodialysis if severe.

CHRONIC TOXICITY - DENTAL FLUOROSIS: Excessive fluoride during tooth development. Enamel hypomineralization. Bilaterally symmetrical. Classified by Dean's Index (0-4). Very mild and mild primarily cosmetic concern. Moderate and severe may require esthetic treatment.

SKELETAL FLUOROSIS: Requires 20-80 mg/day for 10-20 years. Stage 1: Increased bone density, no symptoms. Stage 2: Stiffness, joint pain. Stage 3: Severe restriction, deformities (genu valgum).

DEFLUORIDATION: Nalgonda technique (alum + lime). Activated alumina. Bone char. Reverse osmosis. Target: reduce to less than 1.5 ppm.

CHAPTER 22: FLUORIDES - PART 3: TOXICITY AND SAFETY - DETAILED CONTENT PART 1

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CHAPTER 23: PIT AND FISSURE SEALANTS

DEFINITION: Material placed in pits and fissures to prevent caries by creating physical barrier.

INDICATIONS: Deep pits and fissures, high caries risk, recently erupted permanent teeth, history of caries in primary teeth, orthodontic patients.

TYPES: Resin-based (bis-GMA, urethane dimethacrylate), Glass ionomer (fluoride release), Polyacid-modified composite (compomer).

PROCEDURE: 1) Clean tooth surface (pumice), 2) Isolate (rubber dam preferred), 3) Etch with phosphoric acid 20-30 seconds, 4) Rinse and dry (frosty appearance), 5) Apply sealant, 6) Light cure 20-40 seconds, 7) Check retention and occlusion.

EFFECTIVENESS: 80-90% caries reduction on sealed surfaces. Need periodic evaluation and reapplication if lost. Cost-effective for high-risk children.

FAILURE REASONS: Moisture contamination, inadequate etching, incomplete coverage, insufficient curing.

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CHAPTER 24: ATRAUMATIC RESTORATIVE TREATMENT (ART) AND MID

ART: Approach using hand instruments only and glass ionomer cement. No electricity required. Suitable for field conditions, outreach programs, developing countries.

INDICATIONS: Small carious lesions, no pulp involvement, accessible cavities. CONTRAINDICATIONS: Pulp involvement, large lesions, inaccessible areas.

PROCEDURE: 1) Remove soft tissue and debris, 2) Excavate caries with hand instruments (excavators), 3) Clean cavity, 4) Condition with polyacrylic acid, 5) Place glass ionomer, 6) Shape and finish.

ADVANTAGES: No expensive equipment needed, less painful (no drill), minimal cavity preparation, releases fluoride, good acceptance.

LIMITATIONS: Time-consuming, operator skill dependent, limited to small lesions, technique sensitive.

MINIMAL INTERVENTION DENTISTRY (MID): Philosophy of minimum intervention to restore oral health. Remineralization of early lesions. Atraumatic restorative treatment. Repair rather than replacement of restorations. Minimum cavity preparation. Focus on prevention.

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SECTION F: HEALTH STATISTICS AND RESEARCH METHODOLOGY

(35 pages)

CHAPTER 25: DATA TYPES AND VARIABLES

STATISTICS: Science of collecting, summarizing, presenting, analyzing, and interpreting data. **BIOSTATISTICS:** Application to biological sciences.

DATA TYPES: Qualitative (Categorical) and Quantitative (Numerical).

QUALITATIVE: Nominal (categories without order - gender, blood group, race) and Ordinal (ordered categories - pain severity: mild, moderate, severe; socioeconomic status: low, middle, high).

QUANTITATIVE: Discrete (countable, integers - number of teeth, number of children) and Continuous (range of values - height, weight, pocket depth, temperature).

VARIABLES: Characteristic that can vary. Independent variable (predictor, exposure). Dependent variable (outcome, response).

SCALES OF MEASUREMENT: Nominal scale (names/labels only), Ordinal scale (order matters, intervals not equal), Interval scale (equal intervals, no true zero - temperature in Celsius), Ratio scale (equal intervals, true zero - height, weight, DMFT).

DATA COLLECTION METHODS: Questionnaires, interviews, observation, records/reports, biophysiological measurements.

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CHAPTER 26: MEASURES OF CENTRAL TENDENCY AND DISPERSION

CENTRAL TENDENCY: Single value representing center of data distribution.

MEAN (Arithmetic Average): Sum of all observations divided by number of observations. Formula: $\text{Mean} = \text{Sum of } x / n$. Affected by extreme values (outliers). Uses all data. Can be used in further calculations.

MEDIAN: Middle value when data arranged in order. If odd number of observations: middle value. If even: average of two middle values. Not affected by extreme values. Can locate graphically. Better for skewed data.

MODE: Value occurring most frequently. Can be bimodal (two modes) or multimodal. Not affected by extremes. Applicable to qualitative data.

DISPERSION: Spread of data around central value.

RANGE: Maximum - Minimum. Simple but affected by extremes.

STANDARD DEVIATION (SD): Average distance from mean. Square root of variance. Formula: $\text{SD} = \sqrt{\text{sum of squared deviations}/(n-1)}$ for sample. Most commonly used measure of dispersion.

STANDARD ERROR (SE): Precision of sample mean. Formula: SE equals SD divided by square root of n. Smaller than SD. Decreases with larger sample size.

COEFFICIENT OF VARIATION (CV): Relative variability. $\text{CV} = (\text{SD}/\text{Mean}) \times 100\%$. Allows comparison of variability between different scales.

CHAPTER 26: MEASURES OF CENTRAL TENDENCY AND DISPERSION - DETAILED CONTENT PART 1

COMPREHENSIVE EXPANDED CONTENT FOR EXAM PREPARATION

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Prevention operates at multiple levels. Primary prevention prevents disease occurrence through measures like immunization and health education. Secondary prevention detects disease early through screening. Tertiary prevention reduces disability through rehabilitation.

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CHAPTER 27: NORMAL DISTRIBUTION AND PROBABILITY

NORMAL DISTRIBUTION: Bell-shaped, symmetrical curve. Mean = Median = Mode. Total area under curve = 1 (100%). Described by mean and standard deviation.

EMPIRICAL RULE (68-95-99.7 rule): 68% of data within ± 1 SD of mean. 95% of data within ± 2 SD of mean. 99.7% of data within ± 3 SD of mean.

STANDARD NORMAL DISTRIBUTION: Z-score = $(X - \text{Mean})/\text{SD}$. Mean = 0, SD = 1.

PROBABILITY: P-value measures strength of evidence against null hypothesis.

P < 0.001: Very highly significant (***) . P < 0.01: Highly significant (**). P < 0.05: Significant (*). P > 0.05: Not significant (NS).

CONFIDENCE INTERVAL: Range of values likely to contain true population parameter. 95% CI most commonly used. If 95% CI does not include null value, result is statistically significant.

HYPOTHESIS TESTING: Null Hypothesis (H0): No difference/effect. Alternative Hypothesis (H1): Difference exists. Type I error: Reject true H0 (false positive, alpha). Type II error: Fail to reject false H0 (false positive, beta). Power = 1 - beta (probability of detecting true effect).

CHAPTER 27: NORMAL DISTRIBUTION AND PROBABILITY - DETAILED CONTENT PART 1

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CHAPTER 28: TESTS OF SIGNIFICANCE

PARAMETRIC TESTS: Assume normal distribution, interval/ratio data.

STUDENT T-TEST: Compare means of two groups. Independent t-test (unpaired groups). Paired t-test (same group before/after).

ANOVA (Analysis of Variance): Compare means of 3+ groups. One-way ANOVA (one independent variable). Two-way ANOVA (two independent variables).

NON-PARAMETRIC TESTS: No assumption of normality, ordinal/nominal data.

CHI-SQUARE TEST: Association between categorical variables. Compare observed vs expected frequencies. Requirements: Expected frequency >5 in most cells.

MANN-WHITNEY U TEST: Non-parametric alternative to independent t-test. Compares two independent groups.

WILCOXON SIGNED-RANK TEST: Non-parametric alternative to paired t-test. Compares paired observations.

KRUSKAL-WALLIS TEST: Non-parametric alternative to one-way ANOVA. Compares 3+ independent groups.

CORRELATION: Relationship between two continuous variables. Pearson correlation (parametric, linear). Spearman correlation (non-parametric, monotonic). r ranges from -1 to +1.

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CHAPTER 29: RESEARCH METHODOLOGY

RESEARCH: Systematic investigation to establish facts and reach conclusions.

TYPES: Basic/Fundamental (pure science). Applied/Clinical (practical problems). Descriptive (what). Analytical (why). Quantitative (numerical). Qualitative (non-numerical).

RESEARCH PROCESS: 1) Identify problem, 2) Review literature, 3) Formulate hypothesis, 4) Design study, 5) Collect data, 6) Analyze data, 7) Interpret results, 8) Report findings.

SAMPLING: Probability sampling (random, every element has known probability): Simple random, Systematic, Stratified, Cluster. Non-probability sampling (convenience, purposive).

SAMPLE SIZE: Determined by power analysis. Factors: Effect size, Significance level (alpha), Power (1-beta), Variability in population.

VALIDITY: Internal validity (study measures what intended, free from bias). External validity (generalizable to other populations/settings).

RELIABILITY: Consistency of measurement. Test-retest reliability. Inter-rater reliability. Internal consistency (Cronbach alpha).

ETHICS: Informed consent. Beneficence (do good). Non-maleficence (do no harm). Justice (fair distribution). Institutional Review Board (IRB) approval required.

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