

MINISTRY OF EDUCATION & TRAINING

MINISTRY OF HEALTH

NATIONAL INSTITUTE OF MALARIOLOGY-PARASITOLOGY AND ENTOMOLOGY



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**RESEARCH ON THE STATUS OF ORAL  
FUNGAL INFECTIONS AND QUALITY OF  
LIFE OF DENTAL PROSTHETIC WEARERS IN  
NAM DINH PROVINCE (2019 - 2021)**

**Major: Epidemiology**

**Code: 9720117**

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**Reviewer 1:**.....

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**Reviewer 3:**.....

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The thesis will be defended in front of a thesis examination committee at the National Institute of Malariology Parasitology and Entomology at time ....date .....

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## **LIST OF ABBREVIATIONS**

<b>Abbreviation</b>	<b>Full text</b>
OHIP	The Oral Health Impact Profile
PCR	Polymerase Chain Reaction
Qol	Quality of life
RFLP	Restriction fragment length polymorphism
WHO	World Health Organization

## **NEW CONTRIBUTIONS AND PRACTICAL SCIENTIFIC SIGNIFICANCES OF THE THESIS**

- The study has determined the rate of oral fungal infection, oral fungus species composition in denture wearers, from which to select antifungal drugs to effectively treat oral fungal infections. This is a baseline data source, a reference for similar or extended studies in this field at the current time and place.

- The study has identified a number of factors related to oral fungal infection in denture wearers in Nam Dinh province as a basis and lessons to be applied to other regions with similar characteristics or other regions. in Vietnam for the selection of some interventions to prevent oral fungal infections in denture wearers, in order to improve the oral health of prosthetic wearers.

- The study has evaluated the factors affecting the quality of life in denture wearers with oral fungal infections, thereby helping to choose some interventions to prevent oral fungal infections in denture wearers, recommend recommend government leaders to support to improve the quality of life in dental prosthetic wearers with oral fungal infections.

## **STRUCTURE OF THE THESIS**

The main content of the thesis consists of 129 pages and is divided into parts: Introduction (02 pages); Document overview (32 pages); Scientific objects and methods (27 pages); Research results (44 pages); Discussion (21 pages); Conclusion (02 pages); Recommendation (01 page). The thesis consists of 39 tables and 17 figures (maps, charts, diagrams) and 206 references (26 Vietnamese documents and 180 English documents), in which the number of documents published within the last 5 years is 131 documents, with related appendices.

## INTRODUCTION

Fungal stomatitis in patients with dental restorations is associated with some pathological symptoms in the oral cavity caused by wearing dentures. Some studies in the world have shown that: Fungal stomatitis in patients wearing dentures has a high rate and affects the quality of dentures: *Candida* fungi isolated from the oral cavity account for 50% to 60% of denture wearers. The rate of oral fungal infection in patients wearing dentures is from 58.3 to 93.8%. In Vietnam, there is a study that shows that 32.25% of diseases are infected with oral thrush in the oral mucosa and 35.5% of dentures are infected with oral thrush.

Nam Dinh is a province located in the southern part of the Red River Delta, still facing many difficulties in health care in general and oral health care in particular. The prevalence of dental disease is quite high, 95.2% has dental disease. To date, there have been no studies on oral fungal infections in denture wearers.

Currently, there have been studies on oral disease and quality of life in different population groups in the community, but studies on oral fungal infections, quality of life in denture wearers are still limited. is quite limited, therefore, the study of infection rates, identification of oral fungal species composition, determining some factors related to oral fungal infection and quality of life in denture wearers is a necessary and highly practical issue. Based on the above reasons, we conduct a research project: “***Research on the status of oral fungal infections and quality of life of dental prosthetic wearers in Nam Dinh province (2019 - 2021)***”. The study was conducted with the following three objectives:

1. *Determining the infection rate and some factors related to oral fungal infection in dental prosthetic wearers in Nam Dinh province (2019-2021).*
2. *Determination of oral fungal species composition in dental prostheses.*
3. *Evaluation of quality of life in dental prosthetic wearers with oral fungal infection.*

## Chapter 1

### LITERATURE REVIEW

#### 1.1. Some basic concepts, terms and theoretical bases used in the research

- Oral thrush is a condition that includes a fungal infection of the oral mucosa such as the lining of the gums, jawline, cheeks, lips, tongue, and dental restorations such as dentures, dental prostheses. Manifestations of damage to the oral mucosa are white plaques sticking to the surface of the oral mucosa, congested tongue, and bleeding easily.

- Fungi are considered a separate kingdom, having the following characteristics: They are eukaryotic, cell-walled, heterotrophic and reproduce by spores. Fungi are divided into two groups:

+ Yeast: has a unicellular structure, so it is also called unicellular fungus

+ Filamentous fungi: Have a multicellular structure with a complex filamentous system and are also known as molds.

- Orthodontic restoration is a specialty, specializing in the study of restoring lost teeth or tooth structures in order to regenerate and maintain aesthetics and function. Dental restorations include fixed and removable dental restorations.

+ Fixed dental prosthesis is a type of dental restoration made to cover the crowns of teeth that have lost large tooth tissue, to replace lost crowns or to restore teeth that have been completely lost, this type of restoration attached to the patient's tooth.

+ Removable dental prosthesis is a type of restoration that replaces missing teeth with dentures located on a denture that can be removed and inserted into the mouth by the patient wearing this denture.

According to the World Health Organization (WHO). Quality of Life as an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals,

expectations, standards and concerns. It is a broad concept that is complexly influenced by their physical health, psychological state, personal beliefs, social relationships and their relationship to salient features of the environment.

## **1.2. Rate of infection and some factors related to oral fungal infection in dental prosthetic wearers**

- Characteristics of oral fungal infection in dental prosthetic patients around the world: In patients wearing removable dentures, up to 65% have oral fungal infections. According to other research results, 83% of patients wearing removable denture restorations have the presence of oral thrush. *Candida albicans* infection in patients wearing full dentures was 73.9% and in patients wearing partial dentures was 51.7%. In another study also conducted at Pará in Brazil, *Candida albicans* infections were found in the oral cavity, in 60% to 100% of denture wearers. *Candida albicans* is the most common species, accounting for 60% to 100% of people wearing fungal dentures, of which *Candida albicans* is the most common species, accounting for nearly 70%.

- Characteristics of oral fungal infection in patients wearing dentures in studies in our country: There have been studies showing that 32.25% of patients have oral fungal infections in the oral mucosa and 35.5% of dentures have oral fungal infections

- Determining the rate of oral fungal infection by fresh endoscopy, cultured on Sabouraud's medium.

+ Fungal microscopy is a technique to look for fungi in specimens collected by treating the specimens with common chemicals. Prepare instruments, chemicals, and specimens and proceed through the following steps.

Step 1: Mark the template.

Step 2: Take some specimen on the slide.

Step 3: Put 1-2 drops of fresh reagent on the specimen.

Step 4: Cover the lamella.

Step 5: For KOH solution, wait for 15 - 30 minutes, if you want to observe immediately, heat it on the flame of an alcohol lamp.

Step 6: Examine the 40x objective microscope and record the results on the test sheet.

+ Culture technique on sabouroand medium. Incubate at room temperature and 30°C. Monitor cultures, check daily, detect fungus growth.

Step 1: Take a specimen, depending on the location of the disease, the sample is different, the specimen can be taken from the oral mucosa (mucous mucosa of the tongue, gums, cheeks, lips) and dental restorations.

Step 2: Culture the fungus on Sabouraud's medium, incubated at 30°C.

Step 3: Look for fresh mushrooms. When enough time to culture, conduct microscopic assessment of colony morphology, colony form

Step 4: Determine the results by observing the structure, properties, and color of the colonies.

- Some related factors: Demographic factors, some behaviors, knowledge, attitude and practice on prevention of oral fungal infections. The technique identifies some factors related to oral fungal infection in dental prosthetic wearers.

+ Identify some related factors: Collect patient information according to research medical records, questionnaires.

+ Compare some related factors in the fungal infection group with the non-infected group to identify some related factors.

### **1.3. Determination of oral fungal species composition in dental prosthetic wearers**

Determination of fungal species composition by culture method on ChromAgar™ *Candida* identification medium, PCR molecular biology test, gene sequencing.



- Technique of fungal culture on agar agar CHROMagar™ Candida

Turn on the ultraviolet light in the biosafety cabinet (microbiological cabinet) 15 minutes before performing the operation.

Remove the CHROMagar™ Candida medium (manufactured by CHROMagar, France) from the storage cabinet. Place the agar plate in the microbiological cabinet.

Take the positive specimen (or sabouraud agar containing the fungal strain) on the surface of the plate/tube of medium.

Place the plate/tube of agar in the incubator, incubate at 30-35°C in the presence of oxygen. Read results after 24-48 hours. Mushroom species were identified based on color according to the manufacturer's instructions.

- Fungal PCR-RFLP technique is conducted according to the following steps:

Step 1: Extract DNA.

Step 2: Run PCR with primer pairs ITS1 and ITS4.

Step 3: Use restriction enzymes to cut PCR product DNA into fragments of different sizes.

Step 4: Electrophoresis on 2.0% agarose gel.

Step 5: Compare DNA fragments between research subjects.

- Fungal gene sequencing technique: PCR products were purified and sequenced directly by ABI 3500.

Step 1: Extract total DNA

Step 2: Perform PCR

Step 3: Electrophoresis check the product

Step 4: Gene Sequencing

Step 5: Check and compare the gene sequence of the fungus on the international gene database.

#### **1.4. Evaluation of quality of life in dental prosthetic wearers with oral fungal infection**

Evaluation of quality of life in prosthodontic wearers is an assessment of the overall quality of life in prosthodontic wearers using a shortened toolkit to assess overall quality of life, WHOQoL-bref and assessment of dental restorations. impact on overall quality of life using the OHIP-19 toolkit.

- WHOQoL-Bref toolkit, including 26 questions and divided into 04 areas: physical health, mental health, social relations and environment. Physical health includes 07 criteria, assessing pain level, energy, sleep quality, mobility, daily functioning, medication use and ability to work. Psychological well-being is measured by six factors including positive feelings about life, concentration level, self-worth, satisfaction with body form, negative feelings and feelings about life. meaningful. Social relations include 03 factors: Satisfaction with relationships, satisfaction with social support and satisfaction with sex life. The environmental part will be measured through 08 factors including feeling of safety, satisfaction with living conditions, financial status, access to health services, recreational activities, information, transportation. and environmental health. Each sentence is evaluated at 5 different levels, from low to high and corresponds to a score from 01 to 05 scores. Questions 03, 04, and 26 give the opposite score because this is a negative question.

- OHIP-19 toolkit, including 19 questions related to 7 areas: functional limitations, physical pain, psychological discomfort, physical disability, psychological disability, social disability and disability, specifically designed to evaluate the SKRM-related CLCS of patients with tooth loss, wearing dental prostheses. For each question in the OHIP-19 questionnaire, study participants were asked how often they had experienced dental problems on the Likert scale.

## Chapter 2

### RESEARCH SUBJECTS AND METHODS

#### 2.1. Objective 1. Determine the infection rate and some factors related to oral fungal infection in denture wearers in Nam Dinh province (2019-2021)

##### 2.1.1. Subject, location, time of the research

- Research subjects
  - + Denture wearers in Nam Dinh province.
  - + These are samples taken from the mouth of a person wearing dental prostheses in Nam Dinh province. Specimens include cotton swabs, dental plaque (tartar).
  - + These are the patient samples that have been identified for fungal infection and the fungal cultures on sabouroud medium and DNA extraction products.
- Research location
  - + In Nam Dinh province.
  - + Parasitology Department of Military Medical University.
- Research time: From May 2019 to May 2021

##### 2.1.2. Research design and methods

- Research design: Cross-sectional descriptive study
- Research Methods: Quantitative research
- Study sample size: Calculated according to the following cross-sectional descriptive formula.

$$n = Z_{1-\alpha/2}^2 \frac{p(1-p)}{d^2}$$

Where: n is the minimum sample size to be studied

p: The rate of oral fungal infection in dentures is 35.5%, so  $p = 0.355$ .

Then  $(1 - p) = 1 - 0.355 = 0.645$

d: The absolute error is allowed (when  $p = 0.355$ , that is, p is between 0.3 and 0.7), so we choose d to be 09% ( $d = 0.09$ ).

$Z_{1-\alpha/2}$  : Z value obtained from Z table corresponding to the selected value.

$Z_{1-\alpha/2} = 1.96$  (with a 95% confidence interval).

Instead of the formula, we can calculate  $n = 108.6$  rounded to 109. To ensure that the sample size is not reduced in the study, we increase it by 10%, so the minimum sample size to be studied will be  $n = 120$ . We actually collected 132 patients.

- Criteria and sampling method: Select a stratified random sample of denture wearers (from 04 weeks or more) in Nam Dinh province, meeting the selection criteria and exclusion criteria.

##### 2.1.3. Research content

- Determining the rate of oral fungal infection in denture wearers based on fresh endoscopy and fungal culture techniques on Sabouraud's medium.
- Determining some factors related to oral fungal infection in denture wearers based on analysis of the relationship between socio-demographic factors, some behaviors and factors of knowledge, attitude and Oral fungal infection prevention practice with oral fungal infection in prosthetic wearers.

#### **2.1.4. Variables in the study**

Demographic, sociological, behavioral, knowledge, attitude and practice in preventing oral fungal infections, characteristics of fungal infection rates.

#### **2.1.5. Techniques used in the study**

- Determining the rate of oral fungal infection through research records and using techniques: examination techniques, questioning techniques, techniques for taking samples for testing, packing and transporting samples, and techniques. fresh spectroscopy, mushroom culture technique on Sabouraud's medium.

- Identify some factors related to oral fungal infection in people with dentures through research medical records and questionnaires. Compare some related factors in fungal infection group with non-infected group to identify some related factors.

### **2.2. Objective 2. Determination of oral fungal species composition in dental prosthetic wearers**

#### **2.2.1. Subjects, place and time of the research**

- Subjects of the study: These are the patient samples that have been identified as having fungal infection in target 1.

- Research location: Carrying out culture test on CHROMagar™ Candida medium, PCR-RFLP at the Department of Parasitology Department of Military Medical Academy and testing by genetic sequencing at the Department of Molecular Biology of the Military Medical Academy. National Institute of Malaria, Parasitology and Entomology.

- Research time: From May 2019 to May 2021.

#### **2.2.2. Research design and methods**

- Research design: Experimental description in the fungal laboratory.

- Research method: Quantitative research.

- Sample size in the study: All samples were identified as fungal infections of patients wearing upper dental restorations.

- Sampling method: These are patient samples that have been identified as having fungal infection and fungal cultures on sabouroud medium and DNA extraction products.

#### **2.2.3. research content**

- Determination of morphological patterns of fungi: The morphological samples were determined as yeast or filamentous fungi based on colony characteristics and microscopic images on microscope at 40X objective.

- Determination of single infection or multiple infection based on fungal species composition

- Determination of fungal species composition: The fungi were identified based on the results of culture on CHROMagar™ Candida medium, PCR-RFLP product size analysis, the number and size of cut fragments based on the results. PCR and/or restriction product electrophoresis and sequencing

#### **2.2.4. Variables in the study**

The morphological variables of the fungus, the status of single or multiple infections, and the species composition.

### **2.2.5. Techniques used in the study**

- Culture technique on Chromagar™ Candida identification medium.
- PCR-RFLP technique.
- Gene sequencing techniques.

## **2.3. Objective 3. Assess quality of life in dental prosthetic wearers with oral fungal infection**

### **2.3.1. Subjects, place and time of the research**

- Research subjects: All people wearing dental restorations participating in the study.
- Research location: In Nam Dinh province
- Research time: From May 2019 to May 2021.

### **2.3.2. Research design and methods**

- Study design: Descriptive and analytical study.
- Research method: Quantitative research.
- Sample size in the study: All study participants in objective 01.
- Convenience sampling: There were 132 people with dental restorations, identified in objective 1, with oral fungal infection or no fungal infection, satisfying the selection and exclusion criteria.

### **2.3.3. research content**

Evaluation of quality of life in dental prosthetic wearers with oral fungal infection through the WHOQol-Bref questionnaire and the OHIP-19 questionnaire to determine:

- Quality of life in dental prosthetic wearers with oral fungal infection.
- Comparison of quality of life in denture wearers with oral fungal infection and denture wearers without oral fungal infection.

### **2.3.4. Variables in the study**

Variables on quality of life and variables on the influence of prosthetic wearers on quality of life.

### **2.3.5. Techniques used in the study**

- Information collection tool: Data is collected through a set of questions.
- Information collection techniques: The research will collect information through the following techniques: Interview and fill out a questionnaire.

## **2.4. Data entry, analysis and processing methods**

- Data is cleaned before data entry. All data is entered into the computer by Excel program with office 2016.
- After data entry, all data is transferred to SPSS 20.0 for processing and data analysis.
- Using descriptive statistical analysis methods, univariate and multivariate analysis models with statistical tests to describe general information and the status of oral fungal infections, analyze some factors related to the status of oral thrush. Oral fungal infection, quality of life in denture wearers.

## **2.5. Errors and Error Control Measures**

### **2.5.1. Error**

Errors that can be encountered in research are information errors, random errors and systematic errors in the process of designing and collecting information.

### **2.5.2. Error Control Measures**

- For information errors: Standardize the data collection toolkit, and provide training for staff participating in the research. Before the interview, explain to the research participants clearly the content, purpose and meaning of the research. Conduct a pilot survey of the questionnaire, correcting inappropriate questions when interviewing research participants.

- For random and systematic errors.

- + Select enough sample size and select the sample must comply with the sampling method.

- + Selection error: Limit selection error by choosing the right object.

- + Design the survey form: The content is simple, easy to understand, clear, easy to make statistics, suitable for the research participants.

- + Select research participants according to research criteria.

- + The doctor who examines is a doctor who specializes in oral and maxillofacial surgery.

- + Examination techniques, interviewing techniques, specimen collection techniques, specimen packaging and transportation, fresh endoscopy techniques, culture techniques, PCR techniques, and genetic sequencing techniques technical process.

- + The clinical examination method was agreed in the research group, using the same set of tools.

- + Conduct a trial survey to correct the questionnaire.

- + Train and supervise well examiners and note-takers.

- + Clean and encrypt data before entering into the computer.

### **2.6. Ethics in research**

- The study was approved by the Ethics Committee in Biomedical Research of the National Institute of Malaria-Parasitology-Entomology.

- The study has strictly implemented ethical regulations in biomedical research.

- Research participants are informed about the research program and have written consent to participate in the research program.

- Research participants voluntarily consent and have the right to withdraw when they do not want to participate in the study.

- Research participants do not have to pay fees when participating in the study.

- Data, information and results about the research will be encrypted to ensure confidentiality and for the sole purpose of serving the research.

- Research participants with incorrect dental restorations will be consulted, assisted in correction or referred to medical facilities for examination and treatment.

- All people with oral fungal infection results will be consulted and referred to medical facilities for examination and treatment.

### Chapter 3

#### RESEARCH RESULTS

#### 3.1. Infection rate and some factors related to oral fungal infection among prosthetic wearers in Nam Dinh province (2019-2021)

##### 3.1.1. Some general characteristics of the study subjects

**Table 3.1. General information about research subjects (n=132)**

Content		Amount	Ratio (%)
Gender	Male	74	56.1
	Female	58	43.9
Age group	< 16	1	0.76
	16 - 34	29	21.9
	35 - 44	18	13.6
	45 - 60	55	41.7
	> 60	29	22.0
Marital status	Married	105	79.5
	Unmarried	27	20.5
Academic level	Below high school	51	38.6
	High school or equivalent	40	30.3
	Intermediate, College, University,	41	31.1
	Postgraduate		
Occupation	Farmers	26	19.7
	Officers, employees, workers	20	15.2
	Pupil, student	6	4.5
	Old age, retirement	25	18.9
	Freelance	55	41.7
Personal history of oral thrush	Yes	1	0.8
	No	131	99.2
Personal history of wearing dentures	Yes	119	90.2
	No	13	9.8
History of systemic illness	Yes	1	0.8
	No	131	99.2
Type of prosthetics	Fixed dentures	91	68.9
	Removable dentures	6	4.5
	Dentures on Implant	4	3.0
	Mixed dentures	31	23.5
Time to wear dentures	< 5 years	97	73.48
	From 5 years to 10 years	30	22.73
	> 10 years	5	3.79
Personal income	Depends on family	11	8.3
	< 3 million VNĐ	25	18.9
	≥ 3 million VNĐ	96	72.7

Comment: In the study, the number of men was 74 people (56.1%), women were 58 people (43.9%), the number of people from 45 to 60 years old was 55 people (accounting for 43.9%). 41.7%), the majority are married, have a spouse is 105 people (accounting for 79.5%), the majority have self-employed is 55 people (accounting for 41.7%), the number of people wearing clothes The majority of people with fixed prostheses are 91 people (accounting for 68.9%),

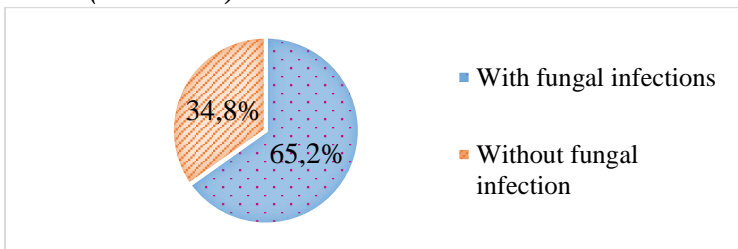
the number of people wearing prosthetics for less than 5 years is 97 people (accounting for 73.5%).

**Table 3.2. Some behaviors and knowledge, attitudes and practices on prevention of oral fungal infections in prosthetic wearers (n=132)**

Content	Classify	Amount	Ratio (%)
Smoke	Yes	28	21.2
	No	104	78.8
Daily brushing	Brush teeth $\leq$ 1 time/day	106	80.3
	Brush teeth $>$ 1 time/day	26	19.7
Regularly wear dentures	Yes	126	95.5
	No	06	4.5
Oral sex	Yes	17	12.9
	No	115	87.1
Do you currently drink alcohol or beer regularly?	Yes	34	25.8
	No	98	74.2
Are you currently being treated for oral diseases?	Yes	20	15.2
	No	112	84.8
Are you currently using topical medications, oral hygiene solutions?	Yes	37	28.0
	No	95	72.0
Knowledge about prevention of oral fungal infections	Not good	82	62.1
	Good	50	37.9
Attitudes on prevention of oral fungal infections	Not active yet	86	65.1
	Active	46	34.9
Practice on prevention of oral fungal infections	Not reached	78	59.1
	Reached	54	40.9

Comment: There are 106 people who are currently wearing dentures at the time of examination, 1 time/day, accounting for 95.5%. Knowledge about oral fungal infection prevention is not good 82 people (62.1%). Attitudes on prevention of oral fungal infections are not active 86 people (65.1%). Practice on prevention of oral fungal infections has not reached in 78 people (59.1%).

### 3.1.2. Prevalence of oral fungal infection among prosthetic wearers in Nam Dinh province (2019-2021)



**Figure 3.1. Rate of oral fungal infection in denture wearers by culture technique on Sabouraud's medium (n=132)**

Comment: In a study of 132 people wearing dentures, 86 people had oral fungal infections, accounting for 65.2%.



**Table 3.3. Detection rate of oral fungal infection in prosthetic wearers by Fresh scanning and Sabouraud's culture technique (n=132)**

Technique	With fungal infections		P
	Amount	Ratio (%)	
Fresh scanning	56	42,4	0,00011
Cultured on Sabouraud's medium	86	65,2	

Using the Z test, compare the fungal identification rates between the two methods.

Comment: The results show that the culture method has a higher rate of identification of the fungus species than the fresh method with  $p < 0.001$ . The culture method has determined that 86 people have oral fungal infections, accounting for 65.2%.

**3.1.3. Some factors related to oral fungal infection in dental prosthetic wearers in Nam Dinh province (2019-2021)**

**Bảng 3.4. Relationship between knowledge, attitude and practice on oral fungal infection prevention and oral fungal infection in denture wearers (n=132)**

Status	Oral fungal infection		OR, 95%CI	p
<b>Knowledge</b>				
Not good	60	22	2,52 (1,20-5,27)	0,014
Good	26	24	1	
<b>Total</b>	86	46		
<b>Attitude</b>				
Not active yet	61	25	2,05 (1-4,31)	0,058
Active	25	21	1	
Total	86	46		
<b>Practice</b>				
Not reached	57	21	2,34 (1,12-4,860)	0,0229
Reached	29	25	1	
<b>Total</b>	86	46		

Comment: The group with poor knowledge was 2.52 times more likely to have oral fungal infections than the group with good knowledge, with  $p < 0.05$ . The group with a negative attitude was 2.05 times more likely to have oral thrush than the group with a positive attitude, but this was not statistically significant with  $p > 0.05$ . The group with poor practice was 2.34 times more likely to have oral fungal infections than the group with good practice, with statistical significance with  $p < 0.05$ .

**Table 3.5. Some demographic factors related to oral fungal infection in dental prosthetic wearers: Univariate and multivariable logistic regression analysis model (n=132).**

Content	Fungal infections		Univariate model OR, 95% confidence interval	Multivariate model aOR, 95% confidence interval
	No	Yes		
	Amount	Amount		
<b>Gender</b>				
Male	27	47	1	
Female	19	39	1,18 (0,57-2,43)	1,41 (0,63-3,13)
<b>Age group</b>				
From 15 to 34	14	16	1	
From 35 to 44	9	9	0,88 (0,27-2,82)	0,81 (0,22-2,94)
From 45 to 60	13	42	2,83 (1,09-7,31)	2,74 (0,88-8,56)
> 60	10	19	1,66 (0,58-4,75)	2,06 (0,58-7,19)
<b>Academic level</b>				
Below high school	22	29	<b>1</b>	
High school or equivalent	9	31	<b>2,61 (1,0-6,59)*</b>	<b>2,99 (1,10-8,16)*</b>
Intermediate, College, University, Postgraduate	15	26	1,31 (0,56-3,05)	1,67 (0,60-4,62)
<b>Occupation</b>				
Officers, employees, workers	3	3	1	
Pupil, student	7	19	2,71 (0,44-16,75)	1,33 (0,15-11,85)
Commercial, industrial	8	13	1,63 (0,26-10,10)	1,08 (0,12-9,29)
Farmer/freelance/Old age, retirement	28	51	1,82 (0,34-9,63)	1,02 (0,14-7,62)
<b>Personal income</b>				
Depends on family, < 3 million VNĐ	15	21	1	
≥ 3 million VNĐ	31	65	1,49 (0,68-3,29)	1,78 (0,69-4,60)

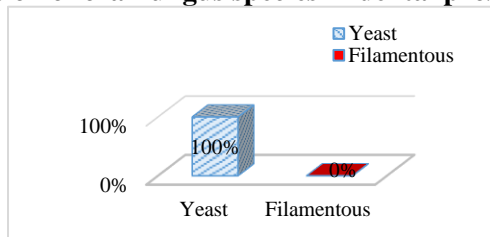
Comment: Results on the relationship between factors and fungal infections. Education level (with a high school education or less) was statistically significantly associated with an increased risk of fungal infection with odds ratios (aOR) and 95% confidence intervals (CI) respectively. : 2.61 (1.0-6.59) times,  $p < 0.05$  and 2.99 (1.10-8.16) times,  $p < 0.05$ .

**Table 3.6. Some behaviors related to oral fungal infection in dental prosthetic wearers (n=132)**

Risk factor		Fungal infections		Univariate model OR, 95% confidence interval	Multivariate model aOR, 95% confidence interval
		No	Yes		
		Amount	Amount		
Smoke	No	43	67	1	1
	Yes	3	19	<b>4,06 (1,13- 14,56)*</b>	<b>8,16 (1,41- 47,2)*</b>
Drink wine and beer regularly	No	39	36	1	1
	Yes	7	50	<b>7,74 (3,11- 19,25)*</b>	<b>4,9 (1,01-22,2)*</b>
Chải răng hàng ngày	Brush teeth ≤ 1 time / day	41	65	1	
	Brush teeth > 1 time/day	5	21	2,64 (0,92- 7,57)	
Wearing dentures	No	13	17	1	
	Yes	33	69	1,59 (0,69-3,67)	
Oral sex	No	39	76	1	
	Yes	7	10	0,73 (0,25- 2,07)	
Currently being treated for oral diseases	No	39	73	1	
	Yes	7	13	0,99 (0,36- 2,69)	
Are using topical medication, oral hygiene solution	No	32	63	1	
	Yes	14	23	0,83 ( 0,37- 1,83)	

Comment: Smoking and drinking are closely related and are factors that increase the risk of oral thrush compared to the other group.

### 3.2. Composition of oral fungus species in dental prosthetic wearers



**Figure 3.2. Species composition of oral fungi by morphology (n=86)**

Comment: The study only shows that 100% of patients with oral thrush are of the yeast type.

**Table 3.7. Determination of oral fungal species composition in dental prosthetic wearers by ChromAgar<sup>TM</sup> Candida method (n=86)**

Nội dung		Amount	Ratio (%)
Môi trường định danh ChromAgar <sup>TM</sup> Candida	Candida	61	70,9
	The species of fungus has not been identified	25	29,1
	Total	86	100,0

Comment: By the method of identification by ChromAgar™ *Candida* identification medium, 61 patients (accounting for 70.9%) had *Candida* infection and 25 patients (accounting for 29.1%) with unknown species composition

**Table 3.8. Determination of oral fungus species composition in denture wearers by PCR-RFLP method (n=86)**

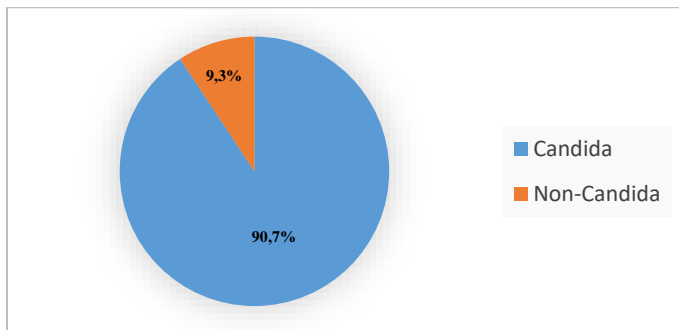
	Content	Amount	Ratio (%)
PCR-RFLP technique, standard DNA scale from 100 bp to 1000 bp	The species of fungus has been identified	67	77,9
	The species of fungus has not been identified	19	22,1
	<b>Total</b>	86	100,0

Comments: By PCR-RFLP technique, there were 67 patients with oral infection with identified species composition (accounting for 77.9%) with oral thrush, 19 patients with unknown fungal infection status (accounting for 22, first%). Of 19 patients with unknown fungal infection status, 16 patients with unknown fungal infection status by PCR-RFLP technique 1st time and 03 patients with unknown fungal infection status by PCR technique- RFLP 2nd time.

**Table 3.9. Determination of oral fungus species composition in dental prosthetic wearers by gene sequencing (n=19)**

Nội dung		Amount	Ratio (%)
Gene sequencing, standard DNA scale from 100 bp to 800 bp	The species of fungus has been identified	19	100
	The species of fungus has not been identified	0	0
	<b>Total</b>	19	100,0

Comment: By gene sequencing method of 19 patients, all 19 patients were able to identify the fungal species composition.



**Figure 3.3. Species composition of oral fungi according to the classification of *Candida* and non-*Candida* infections (n=86)**

Comment: After 03 methods to determine the species composition (culture on Chromagar™ *Candida* medium, PCR-RFLP and gene sequencing), the number of patients with *Candida* infection was 78 patients, accounting for 90.7%. Patients infected with other fungal species were 08 patients, accounting for 9.3%.

**Table 3.10. Synthetic identification of oral fungal species in denture wearers (n=86)**

STT	Species composition	Amount	Ratio (%)
1	<i>C. albicans</i>	43	50,0
2	<i>C. krusei</i>	24	27,9
3	<i>C. glabrata</i>	23	27,7
4	<i>C. parapsilosis</i>	21	24,4
5	<i>C. tropicalis</i>	19	22,1
6	<i>Kodamaea ohmeri</i>	06	7,0
7	<i>Diutina mesorugosa</i>	04	4,7
8	<i>C. guiliermondii</i>	03	3,5
9	<i>Clavispora lusitaniae</i>	02	2,3
10	<i>Trichosporon asahii</i>	01	1,2
11	<i>Ogataea polymorpha</i>	01	1,2

Note: C stands for *Candida*. The percentage is calculated according to the number of patients infected with 01 fungal species / a total of 86 patients carrying PHR with fungal infection.

Comments: Patients wearing dental restorations often encountered 05 types of fungal infections: *C. albicans* accounted for the highest rate, with 43 patients (accounting for 50%), *C. krusei* with 24 patients (accounting for 27.9%). , *C. glabrata* with 23 patients (27.7%), *C. parapsilosis* with 21 patients (24.4%), *C. tropicalis* with 19 patients (22.1%). Two rare fungi are: *Trichosporon asahii* with 01 patient (accounting for 1.2%), *Ogataea polymorpha* with 01 patient (accounting for 1.2%).

### 3.3. Evaluation of quality of life in dental prosthetic wearers with fungal infection

*Table 3.11. Description of WHO BREF and OHIP19 scores in prosthetic wearers with oral fungal infection (n=86) and without oral fungal infection (n=46)*

Content	Fungal infections (n=86)				Without fungal infections (n=46)				P
	The average value	Standard deviation	Min	Max	The average value	Standard deviation	Min	Max	
<b>WHO BREF (Score 100)</b>									
Physical health	30,0	12,5	0	69	66,2	20,1	31	94	
Psychological	35,6	15,4	6	88	70,9	22,4	25	100	
Social relationships	31,9	13,4	0	69	48,5	23,0	6	100	
Environment	28,0	11,0	6	63	47,9	20,4	19	94	
<b>General</b>	31,4	10,0	7,8	70,5	58,4	16,5	26,5	92,5	0,00001
<b>OHIP19</b>									
Functional limitation	11,2	2,8	3	15	8,0	2,6	3	14	
Physical pain	13,0	4,7	7	20	9,4	2,5	4	17	
Psychological discomfort	6,3	2,4	2	10	4,6	1,4	2	8	
Physical disability	9,7	3,4	4	15	7,0	1,8	3	13	
Psychological disability	5,2	1,1	3	8	4,9	1,3	2	10	
Social disability	7,6	1,2	5	12	7,3	1,6	4	13	
Handicap	5,1	0,8	4	7	4,9	1,3	2	8	
<b>General</b>	58,1	11,6	34	82	46,0	8,4	28	76	0,00001

Comment: The overall quality of life according to the WHOQol-Bref questionnaire in the group with oral fungal infection (31.4 scores), was lower in the group without oral fungal infection (58.4 scores) and this is significant. Statistical significance with  $p < 0.001$ . The overall score affecting quality of life according to the OHIP-19 questionnaire in the group with oral fungal infection (58.1 scores), was lower in the group without oral fungal infection (46.0 scores) and this is significant. statistical with  $p < 0.001$ .

## Chapter 4

### RESEARCH DISCUSSION

#### 4.1. Prevalence and some factors related to oral fungal infection among prosthetic wearers in Nam Dinh province (2019-2021)

##### 4.1.1. General characteristics of the study participants

Our study was conducted on 132 people wearing dentures in Nam Dinh province.

General characteristics of demographics, sociology. Table 3.1, shows:

- Gender distribution of research subjects: There were 132 PHR carriers participating in the study, of which 74 were men (accounting for 56.1%) and 58 were women (accounting for 43.9%). Our research results on gender distribution are similar to those of Ahmed et al. in Lahore, Pakistan.

- Distribution of study subjects on marital status: The marital status with a spouse is 105 patients (accounting for 79.5%), the rest is single and unmarried is 27 patients (accounting for 20.5 patients). %). Our research results are similar to the research results of Prapin Piampring in Bangkok, Thailand.

- Distribution of study subjects on educational status: 51 people from high school and below, accounting for 38.6%. High school and equivalent qualifications are 40 people, accounting for 30.3%. The level of TC, college, university, post-graduate level is 41 people, accounting for 31.1%. Our study results on the educational status of PHR carriers, the percentage of educational attainment at all levels is similar, but in the study of Namano and Komin in Bangkok, Thailand, patients have high school education mainly, accounting for 63.3%.

##### 4.1.2. Prevalence of oral fungal infection among prosthetic wearers in Nam Dinh province (2019-2021)

- Figure 3.1 shows that: In a study of 132 people wearing dentures, 86 people had oral thrush, accounting for 65.2% and 46 patients did not have oral thrush, accounting for 34.8%. Our research results are higher than those of Dam Ngoc Tram et al, when conducting a study to identify oral thrush in patients wearing dentures at the Institute of Oral, Maxillofacial and Department of Microbiology, Hanoi Medical University was 35.5% presence of fungus in dentures and 32.25% occurrence of fungus in oral mucosa. The results of our study are similar to the results of Daniluk et al., the rate of oral thrush in patients with PHR is 66.7% in Białystok, Poland.

- Table 3.3, shows only: The results show that the culture method has a higher rate of identifying fungal species than the fresh scanning method and this is statistically significant with  $p < 0.001$ . The results of the study showed that the culture method determined that 86 denture wearers were infected with oral fungus, accounting for 65.2% and 46 denture wearers were not infected with oral

fungus, accounting for 34.8% . The results of our study are similar to those of Wickes et al., and similar to the results of Mohammadi et al.

#### ***4.1.3. Some factors related to oral fungal infection in dental prosthesis wearers in Nam Dinh province (2019-2021)***

- Table 3.4, just shows: The group with poor knowledge is 2.52 times more likely to have oral fungal infections than the group with good knowledge, with  $p < 0.05$ . The group with a negative attitude is 2.05 times more likely to have oral thrush than the group with a positive attitude, but this is not statistically significant with  $p > 0.05$ . The group with poor practice was 2.34 times more likely to have oral fungal infections than the group with good practice, with statistical significance with  $p < 0.05$ . The results of our study are similar to those of Shigli et al. on knowledge, attitude and practice to prevent oral fungal infections related to oral fungal infection in denture wearers.

- Table 3.5, shows only: Results on the relationship between factors with fungal infection. Education level (with a high school education or less) was statistically significantly associated with an increased risk of fungal infection with odds ratios (aOR) and 95% CI (CI), respectively: 2 .61 (1.0-6.59) times,  $p < 0.05$  and 2.99 (1.10-8.16) times,  $p < 0.05$ . Table 3.6, shows only: Results on the relationship between factors with oral fungal infection. Smoking, drinking alcohol are significantly associated with increased risk of fungal infection with odds ratio (aOR) and 95% confidence interval (CI) respectively: 8.16 (1.41-47.2) times,  $p < 0.05$  and 4.9 (1.01-22.2) times,  $p < 0.05$ . Smoking and drinking increase the risk of dental plaque in place and reduce resistance, increasing the likelihood of fungal infections. Meanwhile, in the univariate model, it was shown that good knowledge of oral fungal infection prevention significantly reduced the risk of fungal infection in patients wearing dentures with odds ratio (OR) and 95% confidence interval (CI). ) is 0.33 (0.13-0.84), respectively; 0.26 (0.09-0.72) times, with  $p < 0.05$ . The results of our study are similar to those of Zomorodian et al., when studying 167 patients with dentures in Iran.

#### **4.2. Composition of oral fungus species in dental prosthetic wearers**

- Figure 3.2, shows that: 100% of patients with oral fungal infection belong to yeast species, our study results are similar to the research results of Mai Anh Loi et al (identified 100% of patients with fungal infection at mouth is yeast) when conducting a study on oral fungal infection in cancer patients at 103 Hospital on determining the composition of oral fungus species according to morphology.

- Table 3.7, shows that: Determination of fungal species composition by ChromAgar Candida identification medium, there are 61 patients, accounting for 70.9% of the total 86 patients needing to determine the species composition of oral fungi and 25 patients (accounting for 29.1%) species composition of oral fungi is unknown. Table 3.8, shows only: Determination of oral fungus species



composition by PCR-RFLP method, there are 67 patients who have identified oral fungus species composition, accounting for 77.9% of the total 86 patients who need to determine the species composition of oral fungus species. In the oral cavity, there were 19 patients with unknown species composition of oral fungus, accounting for 22.1% of the total 86 patients who needed to determine the composition of oral fungus species. Table 3.9, shows that: To determine the oral fungus species composition by gene sequencing, a total of 19 patients needed to determine the oral fungus species composition.

#### **4.3. Quality of life in dental prosthetic wearers with oral fungal infection**

Table 3.10. Only shows: Overall quality of life according to the WHOQol-Bref questionnaire in the group with oral fungal infection (31.4 scores) and according to the quality of life classification based on the cut-off points of 33.3 and 66.7, the quality of life quality of life in denture wearers with fungal infection is low), lower than in the group without oral fungal infection (58.4 scores), quality of life in denture wearers without fungal infection is moderate) and this is statistically significant with  $p < 0.001$ . The common scores affecting the quality of life according to the OHIP-19 questionnaire in the group with oral fungal infection (58.1 scores) and according to the quality of life classification based on the 1/2 or 57 point cutoff, affects the quality of life in denture wearers with fungal infection is highly influential), affecting quality of life more than in the group without oral fungal infection (46.0 scores) and affecting quality of life in humans Wearing non-fungal dentures is at a low level of influence and this is statistically significant with  $p < 0.001$ .

### **CONCLUSION OF RESEARCH**

Through the results of research on 132 people wearing dentures in Nam Dinh province, we come to the following conclusions:

#### **1. Prevalence and some factors related to oral fungal infection among prosthetic wearers in Nam Dinh province (2019-2021)**

- The rate of oral fungal infection in denture wearers is quite high, expressed through the following rates and indicators:

- + The rate of oral fungal infection accounted for 65.2%.
- + The rate of oral fungal infection in people wearing fixed dentures is 45.5%; in people wearing removable dental prosthesis is 4.6%; in people wearing dentures on implants is 0.8%; in people wearing combined dental prosthesis (removable, fixed, implant) is 14.4%.
- + The rate of oral fungal infection from samples taken from oral mucosa was 46.2%.
- + The rate of oral fungal infection from specimens taken from dentures was 4.6%.
- + The rate of oral fungal infection from specimens taken from oral mucosa and dentures was 14.4%.

+ The rate of people wearing dentures infected with oral thrush, showing signs of fungal lesions in the mouth is 46.2%.

- Some factors related to oral fungal infection in denture wearers.

+ The group with poor knowledge on prevention of oral fungal infections had an increased risk of oral fungal infection 2.52 times higher than the other group.

+ The group that did not have good practice in preventing oral fungal infections had an increased risk of oral fungal infection 2.34 times higher than the other group.

+ The group with less than high school education is 2.99 times more likely to have a fungal infection in the mouth than the other group.

+ The smoking group had an 8.16 times increased risk of oral fungal infections compared with the other group.

+ The group that drank alcohol regularly had a 4.9 times increased risk of fungal infections in the mouth compared to the other group.

## **2. Composition of oral fungi in dental prostheses**

- 100% of patients with oral fungal infections belong to the yeast species.

- The rate of candida infection is 90.7%.

- The rate of single infection is 50% and the rate of multiple infections is 50%.

- There are 11 species of oral fungus in 86 patients wearing dentures: *C. albican* (accounting for 50%), *C. Krusei* (accounting for 27.9%), *C. glabrata* (accounting for 27.7%), *C. glabrata* (accounting for 27.7%), *C. parapsilosis* (accounting for 24.4%), *C. tropicalis* (accounting for 22.1%), *Kodamaea ohmeri* (accounting for 7.0%), *Diutina mesorugosa* (accounting for 4.7%), *C. Guiliermondii* (accounting for 3.5%), *Clavispora lusitaniae* (accounting for 2.3%), *Trichosporon asahii* (accounting for 1.2%), *Ogataea polymorpha* (accounting for 1.2%).

## **3. Quality of life in dental prosthetic wearers with oral fungal infection**

- Quality of life in dental prosthetic wearers with oral fungal infection according to the WHOQol-Bref questionnaire is low, with a total score of 31.4 scores.

- The impact on quality of life in dental prosthetic wearers with oral fungal infection according to the OHIP-19 questionnaire is high, with a total score of 58.1 scores.

## **RECOMMENDATIONS**

Based on the research results, we make the following recommendations:

- Promote communication and education on oral health for denture wearers.

- Enhance early dental examination when there is damage or abnormality of dental restorations and periodical dental examination to early detect and treat dental restorations.

- Immediately apply measures to prevent oral fungal infections for denture wearers for daily oral care and hygiene in order to improve oral health and reduce the rate of oral fungal infections, contribute to improving the quality of life in denture wearers

- Specialized dental and oral clinics, need to coordinate with all levels, authorities and health in the area, to communicate, educate about oral health, examine, consult, test and treat fungal infections mouth for patients wearing dentures.

- It is necessary to carry out similar research in other localities and regions and proceed to carry out the research nationwide, in order to have general results for the whole country. Since then, recommendations have been made for denture wearers nationwide.

### **SOME LIMITATIONS OF THE RESEARCH TOPIC**

- The study was only carried out on people wearing dental prostheses in Nam Dinh province, but not nationwide, so it cannot represent regions and the whole country.

- Difficulty in the data collection process, due to the nature of work, busy work and study, some patients answered vaguely and finished it during the interview or when filling out the questionnaire. affect research results.

- Difficulty in the process of data collection in the right period of the Covid-19 pandemic, so it is very difficult such as inviting people who wear dental prostheses to participate in the study to visit because there is a time of social isolation, all activities in The process of inviting participants to visit, interview, and fill out questionnaires must be approved by the Covid-19 prevention organization, must strictly comply with Covid-19 prevention, medical declaration, implementing the 5K principle, calling to consult research participants first, there are many cases where it is necessary to rent a motorbike taxi or hire a car to transport research participants to the examination, interview, and take samples for testing.

- Due to the WHOQol-Bref quality of life assessment toolkit guided by WHO is to assess the quality of life in the past 2 weeks, but when collecting data for the past 2 weeks, the study participants were busy with work. It will not reflect the quality of life of the denture wearer.

## **LIST OF SCIENTIFIC RESEARCH RELATED TO THE THESIS HAS BEEN PUBLISHED**

1. Nguyen Huu Ban, Le Ngoc Tuyen, Dinh Tuan Duc et al (2020). Current status of oral fungal disease and some related factors in dental prosthetic patients in Nam Dinh province in 2019-2020. *Journal of Malaria and Parasitic Diseases Control*, 119(5), 86-92.

2. Nguyen Huu Ban, Le Ngoc Tuyen, Dinh Tuan Duc, et al (2021). Current status of knowledge, attitude and practice on oral fungal disease prevention and its relationship in dental prosthetic patients of Nam Dinh province in 2019-2020. *Journal of 108 - Clinical Medicine And Pharmacy*, Volume 16 - Special Issue 4/2021, P. 526-533.

3. Ban N.H., Tuyen L.N., and Duc D.T. (2021). Fungal Infection Rate and Composition Identification of Fungal Species Isolated From the Mouth of Dental Prostheses Patients in Nam Dinh Province, Viet Nam, In 2019-2020. *Ann Romanian Soc Cell Biol*, 7679-7685.

4. Nguyen Huu Ban, Le Ngoc Tuyen, Dinh Tuan Duc, et al (2022). Quality of life among prosthetic wearers in Nam Dinh province, Vietnam, 2019-2021. A study using the WHOQol-Bref toolkit. *Vietnam Medical Journal*, volume 517, issue 1- August 2022. Tr. 111-115.