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Comparative Evaluation of the Antimicrobial Effect of Mangosteen, Triphala, Chitosan, and 2% Chlorhexidine on Mono- and Dual-Species Biofilms of – and *Candida albicans*: An In Vitro Study

✉ Vinoo Subramanaiam RAMACHANDRAN, ✉ Mensudar RATHAKRISHNAN, ✉ Malathy Balaraman RAVINDRRAN, ✉ Venkatesh ALAGARSAMY

ABSTRACT

Objective: The purpose of this *in vitro* study was to compare the antimicrobial effectiveness of 2% chlorhexidine gel, 0.5% chitosan, ethanol extract of mangosteen pericarp, and Triphala used as intracanal medicaments against *Enterococcus faecalis* and *Candida albicans* in mono- and dual-species biofilms.

Methods: Bioactive components in the ethanol extract of mangosteen pericarp and Triphala were evaluated by gas chromatography-mass spectrometry (GCMS). Quantitative assessment of the biofilm formations of *E. faecalis* and *C. albicans* and as a dual-species in the presence of test medicaments was carried out using a crystal violet (CV) assay in a microtiter plate. Following this, 246 single-rooted premolar teeth were collected, and root specimens were prepared. *C. albicans* and *E. faecalis* mono- and dual-species biofilms were grown in the root specimens. At the end of 21 days, the samples were divided into five groups and subjected to different types of medicaments: Control group- distilled water; Chlorhexidine group- 2% chlorhexidine gel; Chitosan group- 0.5% chitosan; Mangosteen group- ethanol extract of mangosteen pericarp; and Triphala group- ethanol extract of Triphala. Colony-forming units (CFUs) were assessed on the first and fifth day after medicament placement.

Results: Microbial population reduction was measured by one-way analysis of variance, followed by post-hoc Tukey's multiple comparison test ($P < 0.05$). Chlorhexidine showed maximum log reduction in CFUs of microorganisms, followed by chitosan, which showed a similar log reduction ($P > 0.05$) for both mono- and dual-species biofilms. However, in the mangosteen and Triphala extract groups, the CFU/mL for dual-species on both days did not have a significant reduction in count ($P < 0.05$) when compared to chlorhexidine and chitosan.

Conclusion: Chlorhexidine showed maximum antimicrobial activity, followed by chitosan, on both mono- and dual-species biofilms. Mangosteen and Triphala had good antimicrobial action on the mono-species biofilm.

Keywords: *Candida albicans* biofilm, chitosan, *Enterococcus faecalis* biofilm, mangosteen, triphala

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HIGHLIGHTS

- This study evaluated the antimicrobial efficacy of 2% chlorhexidine gel, 0.5% chitosan, and ethanol extracts of mangosteen pericarp and Triphala used as intracanal medicaments on mono- and dual-

INTRODUCTION

Microbial biofilms are the major cause of primary and secondary root canal infections, and the success of endodontic treatment relies on its effective eradication.

Original Article

Assessment of Salivary Cortisol Concentrations as a Level of Stress Indicator among Individuals Undergoing Dental Extraction Procedure

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INTRODUCTION

The cortisol hormone is a secretion from the adrenal gland in the zona fasciculata of the adrenal cortex.^[1] The hypothalamus combined effort, pituitary, and adrenal gland (hypothalamic-pituitary-adrenal [HPA] axis) control cortisol secretion.^[2,3] Cortisol hormone influences the processes of metabolism, immunology, and anti-inflammatory actions. The hormone maintains a circadian rhythm.^[4] Dental therapy in anxious patients elevates stress levels.^[1,2,3,4] Stress response excites the HPA axis to secrete cortisol, which in turn brings changes in metabolism, vascular reactivity, includes heart rate (HR), blood pressure (BP), and oxygen

ABSTRACT
Background: Anxious patients tend to exaggerate the aversive events before the actual dental therapy. The anxiety and fear are the major factors that regulate cortisol levels. Aim: Our study aims to estimate the salivary cortisol among patients subjected to dental extraction and correlate any existence between pre- and post-extraction cortisol levels and vital parameters compared to the control group. Methodology: The study sample included sixty individuals, thirty patients indicated for a dental extraction, and thirty healthy patients between the ages of 18 and 60 years. We collected saliva samples from the control group and pre- and post-extraction samples from the study group participants and vital parameters. We used quantitative ELISA Kit, Diagnostics Biochem Canada Inc. (DBC), to estimate the salivary cortisol level. We evaluated the values using the Chi-square test, Pearson correlation test, and paired t-test using the JMP 15; JMP Pro, Version 15 (SAS) Microsoft® Windows® for > 64. Results: The mean value of cortisol concentration of saliva was significantly greater in the preextraction group ($6.13 \pm 0.53 \mu\text{g/dl}$) than after extraction group ($3.17 \pm 0.14 \mu\text{g/dl}$) ($P < 0.001$). There were no significant associations between hemodynamic parameters and salivary cortisol concentration except for the postextraction systolic blood pressure (BP). A comparison of hemodynamic parameters between the study and control group revealed substantial differences in systolic BP. Conclusion: The patient's anticipation and anxiety toward dental therapy elevate the cortisol level. Dental surgeons should treat the patients more conveniently and effectively without any stress and provide a comfortable atmosphere to avoid stress-related consequences.

KEYWORDS: Dental extraction, salivary cortisol, stress fear

saturation (O_2) and affects the sensitivity of the nervous system.^[5]

METHODOLOGY

We selected sixty participants from the outpatient department to take part in the present study. We included thirty patients indicated for extraction in the

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Original Article

The Knowledge and Awareness of Medical Emergencies and Management among Dental Students

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INTRODUCTION

Medical emergencies (MEs) may occur at any time, can be immediately triggered by long-standing dental procedures. The MEs can also be triggered by just being benevolent to grasp the beings' fear and edginess. The incidence of MEs had reported at least two crises in a year.^[1] Another study had pointed out the frequency of 164 events per million dental visits.^[2] A previous study also stated that dentists who practice for four decades would have exposed between 9 and 11 emergencies. About three-fourth of dentists in the UK have witnessed nonlife-threatening crises in their practice.^[3]

ABSTRACT

Background: Every dentist should anticipate being confronted with a medical emergency (ME), and one should always be ready to treat the most catastrophic ones. **Aim:** This study aimed to assess the knowledge of dental clinical students of Tamil Nadu in the ME understanding and management to create awareness toward patient care. **Methodology:** A total of 768 dental students, including final-year students and residents from different colleges, took part in the questionnaire-based cross-sectional study. The selection of study participants was by the convenience sampling method. The questionnaire contained thirty closed multiple-choice questions to assess their knowledge of MEs. Microsoft Office Excel software was used for compiling the answers. The descriptive analysis of the data is exhibited in graphs. **Results:** The majority of participants were mindful of the vital signs; only 55% of the participants know the importance of checking their respiration rate. The knowledge of identifying MEs such as anaphylaxis was 91%, and only 27%-37% of the respondents knew to identify angina, transient ischemia, and lidocaine toxicity. Approximately 15%-40% of the respondents only knew the management of angina, cardiac arrest, hyperventilation, respiratory obstruction, and seizure. Only 10% agreed that the best office emergency kit should be prepared by themselves. Roughly 78% of the respondents were conscious of the patient's referral whenever necessary and aware of state dental acts. **Conclusion:** This study reflects a significant need for training in executing ME among dental students who are to transmute into future dental professionals.

KEYWORDS: Awareness, dental students, emergency kit, management, medical emergency

METHODOLOGY

The current cross-sectional study used a model of the self-administered and structured questionnaire comprising thirty closed-ended multiple-choice questions and complemented by 800 final-year students and interns, given the assurance of confidentiality of their responses. The questionnaire form's reliability established using a pilot test and validity assessed by expertise check. This

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Systematic Review

Malondialdehyde, an Oxidative Stress Marker in Oral Squamous Cell Carcinoma—A Systematic Review and Meta-Analysis

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Abstract: Objective: To qualitative and quantitatively review published literature assessing the oxidative stress marker malondialdehyde (MDA) in oral squamous cell carcinoma (OSCC). Methodology: Pubmed (MeSH), Science Direct, Scopus, Web of Science, Wiley Online Library, Cochrane, and Cross Reference were searched for studies assessing MDA levels in OSCC samples. Results: From the 1008 articles identified, 849 were excluded based on title and abstract screening due to duplication and irrelevance to the topic of interest. Full-text assessment of the remaining 159 articles led to the inclusion of only 46 articles that satisfied the selection criteria. Of these, only 26 studies had data compatible for quantitative analysis. The MDA levels in OSCC groups are significantly increased ($p < 0.00001$) in plasma, serum, and saliva samples in the majority of the studies evaluated. In contrast, MDA levels in OSCC tissue samples are significantly attenuated ($p < 0.00001$) compared to healthy controls, supported by fewer studies. Conclusions: The augmented MDA levels in plasma, serum, and saliva samples of the OSCC reflect the heightened oxidative stress level accurately. Further studies are required to understand the attenuated MDA levels in the tissue samples of OSCC. Correlation analysis between MDA levels with established clinicopathological prognostic markers could aid in formulating oxidative stress-based prognostication and treatment planning.

Keywords: oral squamous cell carcinoma; oral cancer; oxidative stress

1. Introduction

Squamous cell carcinoma (SCC) is one of the most common oral malignancies. The incidence of oral cancer varies greatly. The annual worldwide report states the incidence

A Meta-analysis of Oral Squamous Cell Carcinoma in Young Adults with a Comparison to the Older Group Patients (2014–2019)

Abstract

Background: The oral squamous cell carcinoma (OSCC) often affects elderly aged adults, who had long-term tobacco exposure. In the recent past decade, there is an increasing incidence of OSCC in younger individuals, who had less tobacco association. **Aim:** The aim of this study is to examine the risk factors and to assess and compare the clinicopathological features and prognosis of OSCC in young patients with the older group patients. **Materials and Methods:** We included studies that addressed the OSCC involving young patients during the period between 2014 and 2019. Initially, we found 679 articles; after refined evaluation, 92 works had their titles matching to the present work. After extraction of case reports, reviews, and studies with un-matched objectives or inadequate data, we have chosen only 24 presentations matching to the abstract. The statistical analysis performed by Chi-square tests using SPSS 20.0 version for windows. **Results:** Of the total OSCC, 10% of patients belonged to the younger age group, and 90% were the older aged group. Both the groups showed male gender predominance and tongue as the predominant site of involvement. The younger patients tend to have significantly reduced tobacco exposure. The highly reported tumors were advanced staged and moderately differentiated tumors in both groups. There was a statistically evident high occurrence reported in the younger group. The overall survival seems to be similar for both groups. **Conclusion:** The identification of the potential risk factors, along with unique molecular mechanisms, and biological behavior of the disease is mandatory to control the incidence of OSCC in young adults.

Keywords: Oral cancer; oral squamous cell carcinoma; younger adults

Introduction

Oral cancer is a chief public health concern with the incidence of approximately 350,000 cases annually worldwide.^[1] Histologically, over 90% of oral cancers are squamous cell carcinoma.^[2] Oral squamous cell carcinoma (OSCC) usually affects patients in the sixth to eighth decades of life and reported with a male predilection. The rising trend of the development of OSCC in younger patients is observed in recent literature worldwide. The estimation of the increased incidence of the disease in young patients was 5%–16.5%.^[3]

Materials and Methods

Database searches

Step 1: Electronic search identification

We searched the electronic databases, which include PubMed, Scopus, and Medline, for previously published articles that addressed

the OSCC involving young patients between 2014 and 2019. We selected works only in English, using the following keywords, “oral squamous cell carcinoma,” “young patients,” and “patients under 45 years.”

Step 2: Screening for relevance

We identified the articles that discussed OSCC in young patients. We shortlisted the titles and abstracts of all the collected materials for the screening of relevance and duplication.

Step 3: The articles excluded for the following reasons:

1. Articles with unmatched objective and abstract
2. Being case reports; literature reviews; systematic reviews.

Step 4: We retrieved full-text articles for the selected papers

We independently assessed all the presentations against the following

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Depleting levels of endogenous anti-oxidant superoxide dismutase in oral sub-mucous fibrosis: A systematic review and meta-analysis

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ABSTRACT

Objective: The systematic review is aimed to assess the antioxidant status by superoxide dismutase level in oral sub-mucous fibrosis using available literature.**Materials and methods:** A literature search was accomplished electronically in PubMed (MeSH), Science Direct, Scopus, Web of Science core collection, Cochrane, and Cross-reference, using the keywords such as ‘oral sub-mucous fibrosis’, ‘antioxidant status’ and ‘superoxide dismutase’.**Results:** Of the 282 articles identified, only 16 satisfied the selection criteria and were included in the systematic review. Among the selected, six studies were included for mean level analysis of superoxide dismutase. The assessment showed a significant reduction of serum superoxide dismutase in oral submucous fibrosis patients than in control ($p < 0.004$). The mean difference in serum superoxide dismutase concentration between oral submucous fibrosis and healthy subjects was -86.23 U/ml (95% CI -145.30 , -27.17). The mean SOD level was significantly reduced as the disease progressed to stage I or stage II ($p < 0.001$) compared to the control group.**Conclusion:** The studies showed significantly lower levels of superoxide dismutase in various human samples of patients with OSMF. Therefore, further studies are required to estimate antioxidant status using different biomarkers of oral submucous fibrosis concerning different stages of the disease in order to suggest future therapy.**Clinical relevance:** Assessment of antioxidant activity helps to identify the patients at risk of malignant transformation. It serves as a reliable guide to initiate therapy. It serves as a marker of prognosis in patients suffering from oral submucous fibrosis.

1. Introduction

Oral sub-mucous fibrosis (OSMF) is the most frequent potential malignant disorder in South-East Asian countries.¹ The OSMF shows an initial symptom of a burning sensation to spicy foods.² The other symptoms of OSMF are blebbing, resulting from impairment of local

blood vessels, ulceration, xerostomia, fibrosis of oral mucosa, which progresses to mouth stiffness and trismus.³ Numerous causatives such as betel quid chewing with or without tobacco, chilies, nutritional deficiency, genetic alterations, immunosuppression, and abnormal collagen metabolism were implicated in the pathogenesis of OSMF.⁴

OSMF has shown the potential for malignancy transformation. One

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Anti-candidal Effect of *Ocimum sanctum*: A Systematic Review on Microbial Studies

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Abstract

Candida albicans is the most prevalent candidal species in humans. It is the causative agent and is most commonly associated with more than 90% of serious systemic fungal infections. Even though there are numerous anti-fungal agents, new strains of pathogens develop resistance against these agents. In order to prevent resistance, plant-based drugs can be considered as an alternative therapy. Recent studies show that few herbs consist of active ingredients acting against specific pathogens. The aim of the present study is to understand the anti-candidal effect of *Ocimum sanctum* (Tulsi) based on in-vitro microbial studies. This systematic review followed Preferred Reporting Items for Systematic Reviews and Meta-Analyses Statement Criteria (PRISMA). Articles were collected from the electronic databases of PubMed and Cochrane till 2021. Anti-microbial studies on *O. sanctum* and its action against candidal species were included. We excluded clinical trials, reviews, abstract articles, and interventional studies.

The selected antimicrobial studies used various phytochemical constituents of Tulsi extract, and the anticandidal properties were measured through the zone of inhibition (ZOI). All studies demonstrated the effective anticandidal property of *O. sanctum*, suggesting its possible use as an effective and affordable "adjunct" along with standard care for systemic and topical candidal infections. The main components of *O. sanctum* responsible for anticandidal activity were likely to be eugenol and linalool. However, the mechanism of action of these constituents is unclear. Further research assessing the toxicity, durability, and other assessments followed by clinical trials is necessary to explore the potential of Tulsi in combating oral conditions.

Categories: Infectious Disease, Dentistry, Therapeutics

Keywords: ocimum, candida species, antifungal susceptibility, minimum inhibitory concentration, antifungal resistance, ocimum sanctum, anticandidal effect

Introduction And Background

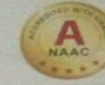
Candida species are the most common organisms involved in topical and systemic fungal infections [1]. *Candida albicans* is the most common and virulent among the candidal species [2,3]. There are numerous anti-fungal agents, but new strains of pathogens develop resistance against these agents. In order to prevent this resistance, plant-based drugs can act as an alternative therapy. Herbal treatments are common among urban and rural communities of the Indian population. Recent studies show that these herbs consist of active ingredients acting against specific pathogens [4].

Ocimum sanctum (Tulsi) is a highly regarded culinary and medicinal aromatic herb from the Lamiaceae family, indigenous to the Indian subcontinent, and which has been utilized in Ayurvedic medicine for more than 3000 years. For its medicinal properties, Tulsi is regarded as an "Elixir of Life" and has been used to treat various ailments. Tulsi leaf extracts are used to treat bronchitis, rheumatism, and pyrosis [5]. Treatment of epilepsy, asthma or dyspnea, hiccup, cough, skin and hematological illnesses, parasite infections, neuralgia, headache, wounds, and inflammation [6], and oral problems [7] are among the other known medicinal uses. Pharmacological and clinical studies showed that *O. sanctum* consists of terpenoids, iridoids, [8] phenolic compounds, and flavonoids. These active components act as anti-microbial, anti-oxidative, anti-inflammatory, anti-articular, and anti-pyretic agents. Only a few studies use *O. sanctum* as an anti-fungal agent [1,9]. The essential oils derived from these specific plants are targeted against the eukaryotic biosynthesis pathway. These are the active end products of cell wall synthesis. Most of the phytochemical constituents of *O. sanctum* alter the fungal organism's structural and functional integrity [1].

A systematic evaluation of studies on using Tulsi as part of a polyherbal formulation against candidal species was conducted through in-vitro studies. This study aimed to summarize and critically evaluate Tulsi to assess the current evidence on the herb's efficacy against candidal species.



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 Professor & Head
 Department of Oral Medicine and Radiology
 Thai Moogambigai Dental College & Hospital
 Dr. M.G.R. Educational and Research Institute
 Golden George Nagar, Mugappair, Chennai - 600 107.

Sub: Confirmation of Provisional Registration for Ph.D. Degree/Part Time/ External/ Oral Pathology and Microbiology in respect of Dr.Khadijah Mohideen

Ref: Report of the Doctoral Committee dated 22.01.2019

The Authorities considered the report of the Doctoral Committee on the Examination under the course work of the Ph.D. Degree conducted for the above candidate and approved the recommendations of the Doctoral Committee that the candidate is fit to proceed with the Ph.D. Degree Programme.

The Provisional Registration of the Candidate for Ph.D. degree is hereby confirmed with effect from 24th February 2018 under Part Time.

The Candidate should submit the thesis after expiry of Four (4) Years and before the completion of Seven (7) Years (i.e. on or after 23rd February 2022 & on or before 23rd February 2025.

The exact title of the thesis must be informed to the University through the supervisor within Six months from the date of confirmation of Provisional Registration.

The Candidate should submit through supervisor, Six copies of the Synopsis of the thesis together with the title of the thesis in the prescribed application form together with the necessary certificates, not less than three months before the submission of the thesis. The number and date of this communication should be quoted in future correspondence.

Thanking You,



Yours faithfully

C. B. Palaniappan
 Registrar

Copy to the Candidate:

Ms. Khadijah Mohideen
 Reader, Department of Oral Pathology & Microbiology
 Sathyabama Dental College & Hospital
 Chennai - 600 119

REGISTRAR
 Dr. M.G.R.
 EDUCATIONAL AND RESEARCH INSTITUTE
 (Deemed to be University)
 Penyar E.V.R. High Road,
 Maduravoyal, Chennai - 600 095

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on 4th March 2022 at 4.30pm



<http://meet.google.com/fbn-ommf-nit>



WHITE LAB Material Research Centre

SAVEETHA DENTAL COLLEGE AND HOSPITAL

Post Bag No.6 # 162, Poanamallee High Road, Chennai - 600 077.
Phone : +91-44-2680 1580-85 (Extension - 9549) Fax : +91-44-2680 0892
e-mail : whitelab.sdc@saveetha.com, Website : whitelab.sdc.saveetha.com



21.03.2022

To whomsoever it may concern

This is to certify that **Dr. Brindha Jain. R.**, a IIIrd year postgraduate student of Department of Conservative Dentistry and Endodontics from Sathyabama Dental College and Hospital, Chennai, Tamil Nadu, had come to **White Lab - Material Research Centre, Saveetha Dental College** for using **INSTRON E3000 UTM** as a part of completion of thesis dissertation entitled "Effect of Biodentine, Everstick Post and Smart Dentin Replacement on Fracture Resistance of Simulated Immature Human Maxillary Central Incisor Teeth with Biodentine Apical Plug- an In-vitro study." from 18.03.2022-21.03.2022.

Thank You



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Sl. No. ME 38399



Register No. : **DS202D003**

Name : **DR.GAYATHRI S**

Degree & Branch : **Ph.D - PERIODONTOLOGY**

GRADE CARD

Month & Year : **JULY 2021**

Faculty : **DENTAL SURGERY**

Semester	Subject Code	Subject Title	Marks	Credits	Grade
1	DDS952	HERBAL BIOMATERIALS IN PERIODONTAL REGENERATIVE THERAPY	72	4	A
1	DDS955	PERIODONTICS	70	4	A
1	DRM902	RESEARCH METHODOLOGY	64	4	B
1	DRP901	RESEARCH AND PUBLICATION ETHICS	80	4	S



Total Credits Earned : **16**

GPA : **8.00**

CGPA : **8.00**





Dr.M.G.R.
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Maduravoyal, Chennai - 600 095, Tamil Nadu, India.
(An ISO 9001 : 2015 Certified Institution)

Sl. No. ME 38400



FICOE/027



Register No. : **DS202D004**

Name : **Dr.NANDHINI V**

Degree & Branch : **Ph.D - PERIODONTOLOGY**

GRADE CARD

Month & Year : **JULY 2021**

Faculty : **DENTAL SURGERY**

Semester	Subject Code	Subject Title	Marks	Credits	Grade
1	DDS953	PERIODONTAL HEALTH IN ALTERED GENDER STATUS	64	4	B
1	DDS956	PERIODONTICS	60	4	B
1	DRM902	RESEARCH METHODOLOGY	82	4	S
1	DRP901	RESEARCH AND PUBLICATION ETHICS	84	4	S



Total Credits Earned : **16**

GPA : **8.00**

CGPA : **8.00**

Date of Issue : **15-SEP-2021**

Grade card format changed from January 2018.

hath



MEENAKSHI ACADEMY OF HIGHER EDUCATION AND RESEARCH

(MEENAKSHI UNIVERSITY)

(Established under Section 3 of the UOC Act, 1956 vide Notification No.F.9-5/2002-U.3, dt.31.03.2004)

Ref: MAHER/M-004 /2015

Date: 19/07/2016

To,
Nandhini A.
Lecturer,
Department of Pharmacology,
Asan Nagar, Keerapakkam Village,
Oragadam Main Road, Chengalpattu-603 105.

Sir,

Sub: Confirmation of Provisional Registration for Ph.D. Degree in respect of
Nandhini A., Part-Time (Pharmacology)
Ref: 1) Provisional Registration No. MAHER/M-004/2015, dated: 16/03/2015.
2) R.A.C. Report dated: 24/06/2016 – Reg.
Title: "Hepatoprotective effect of curcumin against monosodium glutamate
induced toxicity."

1. The Authorities considered the report of the RAC vide reference 3rd cited, on the Research Methodology Examination, conducted for the above candidate and approved the recommendations of the Doctoral Committee that the candidate is fit to proceed with the Ph.D. Degree Programme.
2. The Provisional Registration of the candidate for the Ph.D. Degree is hereby confirmed. No further change in the title is recommended.
3. The candidate is further directed to pay Rs.5000/- (Rupees Five Thousand Only) towards the Methodology Examination fee as DD in favor of Registrar, MAHER payable at Chennai, if it has not been paid earlier.
4. The number and date of this communication should be quoted in future correspondence

J. Arunakaran
Dr. J. Arunakaran
Director-Research

Copy to:
Dr. S. Priya
Lecturer,
Department of Pharmacology,
Sathyabama University Dental College,
Rajiv Gandhi Salai, OMR,
Chennai – 600 119.

12, Vembuliamman Koil Street, West K.K. Nagar, Chennai - 600 078, Tamil Nadu, India.
Tel:91- 44 - 2364 3955 / 2364 3956, Fax:91- 44 - 2364 3958 / 2364 2006
Website : www.maher.ac.in, E-mail : info@maher.ac.in