Dissertation

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KARKINOS

(March 15th 2022 to June 15th 2022)

Study on early detection of Oral cancer using Mobile Phone - A Narrative Review.

By

Meha Saxena
PG/20/032

Dissertation submitted in partial fulfillment of the requirements of the degree PG Hospital and Healthcare Management (2019-2021)

IIHMR DELHI

International Institute of Health Management

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I am glad to acknowledge Dr. Pankaj Talreja (Mentor), for incorporating right attitude into me towards learning and for helping and supporting whenever required,

Meha Saxena

PGDHM

IIHMR DELHI

To Whomsoever It May Concern

This is to certify that **Meha Saxena** student of PGDM (Hospital & Health Management) from International Institute of Health Management Research; New Delhi has undergone internship training at **Karkinos Healthcare** from **15th March to 15th June, 2022.**

The Candidate has successfully carried out the study designated to her during internship training and her approach to the study has been sincere, scientific and analytical.

The Internship is in fulfilment of the course requirements.

I wish her all success in all her future endeavour.

Dr. Sumesh Kumar

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The following dissertation of titled, **Study on early detection of Oral cancer using Mobile Phone - A Narrative Review** is hereby approved as a certified study in management carried out and presented in a manner satisfactorily to warrant its acceptance as a prerequisite for the award of **PGDM (Hospital & Health Management)** for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

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Name	Signature
Dr. S. B. Gogia	

Certificate from Dissertation Advisory Committee

This is to certify that Ms Meha Saxena a graduate student of the PGDM (Hospital & Health Management) has worked under our guidance and supervision. She is submitting this dissertation of titled, **Study on early detection of Oral cancer using Mobile Phone - A Narrative Review** in partial fulfilment of the requirements for the award of the PGDM (Hospital & Health Management).

This dissertation has the requisite standard and to the best of our knowledge no part of it has been reproduced from any other dissertation, monograph, report or book.

Dr. Pankaj Talreja
Associate Professor
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Mr.Samyak Upadhyay
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Karkinos Healthcare

KARKINOS

Date 15-Jun-2022

Internship Certificate

To Whomsoever It May Concern

This is to confirm that **Meha Saxena** is working in Karkinos Healthcare Pvt Ltd, As **"Intern"** as a part of team Technology.

Important Information as per our records:
DOJ: 15-March-.2022
EMP ID: KHPL-I-0098

This letter is issued on the request of the Intern.

Regards,
Pooja Sharma
Vice President – HR

Email id: pooja.sharma@karkinos.in

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled **Study on early detection of Oral cancer using Mobile Phone - A Narrative Review** submitted by Ms. Meha Saxena Enrollment No. PG/20/032 under the supervision of Dr. Pankaj Talreja for award of PGDM (Hospital & Health Management) of the Institute carried out during the period from15th March to 15th June, 2022. Embodies of my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.

Signature

FEEDBACK FORM

Name of the Student: Meha Saxena

Dissertation Organization: Karkinos Healthcare, Bengalore

Area of Dissertation: Early Detection of Oral cancer

Attendance: 100%

Objectives achieved: Yes

Deliverables: Created Product requirement documents, Wireframes, Release notes, Weekly Reports and presentations, Worked on sprint planning and created sprints

Strengths: Good communication skills, Design Thinking, Product Thinking.

Suggestions for Improvement: Nothing as such can work more on attention to detail.

Suggestions for Institute (course curriculum, industry interaction, placement, alumni):

Mr.Samyak Upadhyay
Manager
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Date: 15th June
Place: Bangalore

Abbreviations & Acronyms

Figures

Table of Contents

Acronyms

Pvt.Ltd.	Private Limited
MeMoSa	Mobile Mouth Screening Anywhere
CNN	Convolutional Neural Network
ROI	Region of Interest

Figures

(Section-1)

ORGANIZATIONAL LEARNING

1.1- Introduction

- Karkinos Healthcare Pvt. Ltd, a purpose driven technology-led oncology platform, is focused on designing and delivering bespoke solutions for cancer care. The company, led by a blend of globally acclaimed medical professionals and technologists, is on a mission to create 'cancer centers without walls' with a primary aim of addressing the accessibility or affordability gaps in cancer care

- Karkinos healthcare is a platform built on

  - ✓ **state of the art technology curated for oncology.**
  - ✓ **knowledge network with medical protocols, surgical skills, digital pathology center and**
  - ✓ **with distributed care centers. The substantive portion of the economic interest accrued will be deployed across similar societal causes and in advancement of research, education, and patient care.**

1.2- Vision

Our Vision Powered By 4D's-

"Better Treatment Outcomes, Positive Patient Experience at affordable Cost driven by our **4 D's Framework** Patient Impact and Experiences**"**

- **Detection & Diagnosis** Establishment of participatory systems and near home care Research on genomics as a foundation approach for prevention. Innovation and game-based outreach approach for early diagnosis and wellness.

- **Deliver** managed health care 2 million+ patients served annually 10 million+ patient hours saved annually**.**

- **Data** and research Contribute towards Atmanirbhar Bharat through drug discovery research and treatment innovation Large scale screening and longitudinal data to build robust AI/ML analytics and predictive models.

1.3- Value Proposition

Social Impact

Reduce travel time 8-10 to 3-5 hours; 30-40% reduced cost of care surveillance and early detection. Early detection, better reach out and care improved outcomes.

Distributed Care Network

Reversing current focus from treatment to early detection is possible with a Distributed Care Network

Standardise Care and Experience

Standardised and Patient centric pathways, improve quality in Delivery of care and patient outcomes.

Early Detection

Early Detection Enables Stage Shift in Cancer Incidence

Collaboration Across Care Continuum

Patients Centric approach that enables Care Collaboration across the Patient Care Continuum

Interoperability

Enabling the flow of patient information by adhering to the interoperability standards identified by the NDHM

Plan Centrally Deliver Locally

Command Centre to enable distributed deliver care delivery by a centralised knowledge architecture

Solve for Accessibility

In Patient Centric Model, Karkinos enables access to care near the patient's home driven by Geo-tagging of care partners.

Affordability

A cancer care network enabling early detection with assured, affordable and quality focused treatment pathways.

1.4- About Karkinos

- Karkinos Healthcare plans to address Cancer problems with an end-to-end technology platform which coordinates cancer care continuum; medical center for treatment of complex cancers; and research center which leverages technologies such as genomics, synthetic biology, sensors, and AI to analyze data and leading to the development of affordable cancer interventions.

- The fundamental principle of Karkinos health is democratization of cancer care in a participatory fashion with existing health providers, researchers and technologists.

- **Founded By**
  - KARKINOS HEALTHCARE has been founded by Mr. R Venkataramanan, Advisor to Chairman, Reliance Industries Limited, and former Managing Trustee of the Tata Trusts. The firm is desirous to build an end-to-end technology driven oncology focused managed healthcare platform where almost no person is deprived of care either by lack of access or affordability.

- Design and Delivery
  - The design and delivery will be through bespoke solutions for cancer care, as a one stop shop in experience, addressing core market needs for this specialized health care. It will use technology and Al Based Continuous feedback to improvise care to our own needs, the learning's of which will be scaled up within India and beyond

- Roadmap
  - Karkinos Healthcare over the next 18 months, will be focused on creating the foundation for the following components – a state of the art technology platform curated for oncology, a knowledge network with medical protocols, surgical skills, digital pathology center, along with fifty Level 4, fifteen Level 3, and one Level 1 Centres.

1.5- Services

Karkinos is your comprehensive care partner in your cancer treatment journey

- Risk assessment based Early Screening
- Consult with the best Oncologists
- Experienced Care Navigator
- Near Home Partner Hospitals
- Personalized Advanced Diagnostics
- Mental Health Support
- Community Support
- Nutrition & Lifestyle Management
- Financial Guidance & support
- Cutting Edge Cancer Research

Section 2

Study on Early Detection of Oral cancer Using Mobile Phone - A Narrative Review

2.1 Abstract

Oral Cancer affects millions of individuals all over the world. Oral cancer refers to cancers that may occur in the mouth and mouth structures, including the lips, tongue, cheeks, lower lip, sinuses, and pharynx (throat). If the cancer is not diagnosed and treated promptly, it may result in consequences to the patient's health.

It is possible that fewer people will die from cancer if it is discovered early enough. Early identification of life-threatening disorders, such as oral cancer, may dramatically raise the chance of survival. A deep machine learning technique has been advocated to enhance early cancer detection and hence reduce cancer-related mortality and morbidity. The extraction and processing of critical medical imaging data using this technology has advanced significantly in recent years. Thus, it is feasible to detect oral cancer at an early stage.

In each research project, the methodology is the component that is given the most importance. The efficiency of any research work depends upon the correctness and effectiveness of the research methodology. The research methodology applied is descriptive. This is a piece of secondary research, and the data that will be gathered will come from a variety of sources, such as PubMed.

Using mobile phones to help identify cancer in hard-to-reach locations is a great way to overcome distance limitations. The use of mobile phones has been beneficial to several aspects of cancer care, including early detection, care management, and support for survivors.

Keywords: Cancer, Oral cancer, Early detection, mobile Phone, machine learning, deep learning

2.2-Introduction

Oral cancer is one of the most common cancers in the world, with a high mortality rate. Nearly 177,000 people worldwide will die from cancer of the lips and oral cavity in 2021, according to the International Agency for Research on Cancer. Oral cancer is one of the most common cancers in the world, with a high mortality rate.

A tumor in the mouth is a sign of oral cancer, which causes pain and suffering. It's important to note that the signs and symptoms of oral cancer might include malignant growths on the mouth's surface as well as in its throat. It's critical to get the finest and most timely therapy for oral cancer if you don't want to risk your life. The use of tobacco, heavy drinking, and infection with certain types of HPV are the primary causes of oral cancer around the globe. Oral cancer is largely a disease of the poor, despite differences in risk factors. (Lin, Huiping et al.)

Types of Cancer

- Squamous cell carcinoma - One of the most common types of oral cancer is squamous cell carcinoma, which accounts for more than 90% of all mouth malignancies. This kind of cell, termed a squamous cell, is flat and resembles fish scales under the microscope. Squamous cell carcinoma develops when certain squamous cells mutate and become abnormal.

- Verrucous carcinoma- 5% of all oral cancers are adenocarcinomas, a kind of squamous cell adenocarcinoma with an extremely sluggish growth rate. This type of oral cancer rarely spreads to other parts of the body, but it can invade nearby tissues.

- Minor salivary gland carcinoma: Many forms of oral cancer may develop on the tiny salivary glands in the mouth and throat, and this includes minor salivary gland carcinoma. These include adenoid cystic carcinoma, mucoepidermoid carcinoma, and low-grade polymorphic adenocarcinoma.

- Lymphoma: Oral cancer that develops in lymphatic tissue, which is part of the immune system, is called lymphoma. Both the tonsils and the base of the tongue contain lymphatic tissue.

- Leukoplakia and erythroplakia- The noncancerous disorders of leukoplakia and erythroplakia are caused by the formation of abnormal cells in the mouth or throat. There is a distinct difference between leukoplakia, which appears white and is easily apparent, and erythema, which is red and frequently painful when scratched. Many distinct forms of cancer may be caused by both illnesses. To find out whether the cells are malignant, doctors will do a biopsy or some other kind of test. About 25% of leukoplakia is either cancerous when detected or becomes precancerous. About 70 percent of instances of erythroplakia are deemed malignant at the time of diagnosis, regardless of whether they are found earlier or later.

- Lip Cancer- The most frequent kind of oral cancer, lip cancer, affects mostly males. There are two kinds of cells: squamous and basal. Squamous cells, the thin, flat cells that border the lips and mouth, are the most prevalent kind of lip cancer.

- Tongue Cancer- Cancer that develops at the front of the tongue is known as tongue cancer. Squamous cells are often affected by this kind of cancer.

Oral cancer mortality rates have remained high over the last several decades, despite advances in cancer therapy. A lack of timely and high-quality diagnostic and treatment options for patients with oral cancer in rural locations leads in worse survival rates. Overall 5-year survival rates for individuals with oral cancer range around 50%, depending on race and area; however, survival rates as high as 65% have been seen in certain countries. 66.6 percent of head and neck cancer patients in India are identified at locally advanced stages, according to a recent report from the Indian Cancer Society (Kim et al.). Patients who are diagnosed with oral cancer at an advanced stage have a much lower chance of survival and a worse prognosis. As a result, early identification of oral cancer is critical to improving survival rates.

The survival rate for oral cancer has been greatly improved as a consequence of early detection and treatment. According to a recent research, up to 86% of

patients with oral cancer are present at the ideal time for survival. The difficulty of a patient to get a correct diagnosis from a specialized specialist often results in late births. Because to the rising prevalence of mobile phones, early detection of oral cancer is now possible.(Kim et al.)

Preventative care, treatment, and survival all improve with early diagnosis. In order to better control cancer, this is essential. Predictive precision medicine has been impeded by late diagnosis, despite recent advances in molecular underpinnings of cancer. Because of this, deep machine learning has been advocated as a way to improve early diagnosis and hence minimize cancer-specific mortality and morbidity. (Song et al.) Early-stage oral cancer identification and care may both benefit from automated image processing, which has the potential to aid pathologists and clinicians.

2.3- Research Question

How has smartphone-based images using deep learning has been adopted early detection of Oral cancer?

2.4-Objective

- The explore the possibility of use of smartphone-based images using deep machine learning for detection of oral cancer at an early stage.

2.5-Methodology

- **Research Design:** Descriptive Study
- **Data Type:** Secondary Data
- **Data Collection Method:** Literature Survey
- **Data Sources:** PubMed

Search strategy- Detailed automated literature searches were performed in PubMed from inception until the end of October 2021. The reference lists of potentially relevant reviews were searched to ensure that all the potential studies have been included

Search terms- Combination of Cancer, Oral cancer, Early detection, smartphone, deep learning, machine learning, mobile phone

Inclusion criteria- All reviews that considered deep learning for oral cancer detection and smartphone using deep learning were included. This includes reviews that examined the smartphone based images using deep learning on oral cancer detection.

Exclusion Criteria- study on deep learning but not directly based on smartphone based images, reviews and editorials were excluded.

2.6- Ethical Consideration-

As this research is secondary in nature there are no ethical concerns conform. Patient data is not collected so no consent was obtained.

2.7-Result and Discussion

The Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) methodology was used to document the searching and screening processes in this study. Total 131 potentially relevant articles found on Pubmed. Search protocol use for this [(Smartphone AND Deep learning AND Oral Cancer) by using this found only 3 studies. So we use synonyms of this- (Mobile phone AND Oral cancer AND Early detection) by using this search protocol found 20 studies. (Smartphone AND Oral cancer AND Early detection) by using this search protocol found 10 studies. (Deep learning AND Oral Cancer) by using search this search protocol found 98 studies. So total 131 potentially relevant articles found on Pubmed and after screening- reports excluded those are not in english language, duplicate studies, only abstract, reports that had examined head and neck cancer, Deep learning but not using in smartphone based images and editorial. A total of 15 studies met the

eligibility criteria and were included in this review. The details of the study selection process have been described using the PRISMA flowchart.

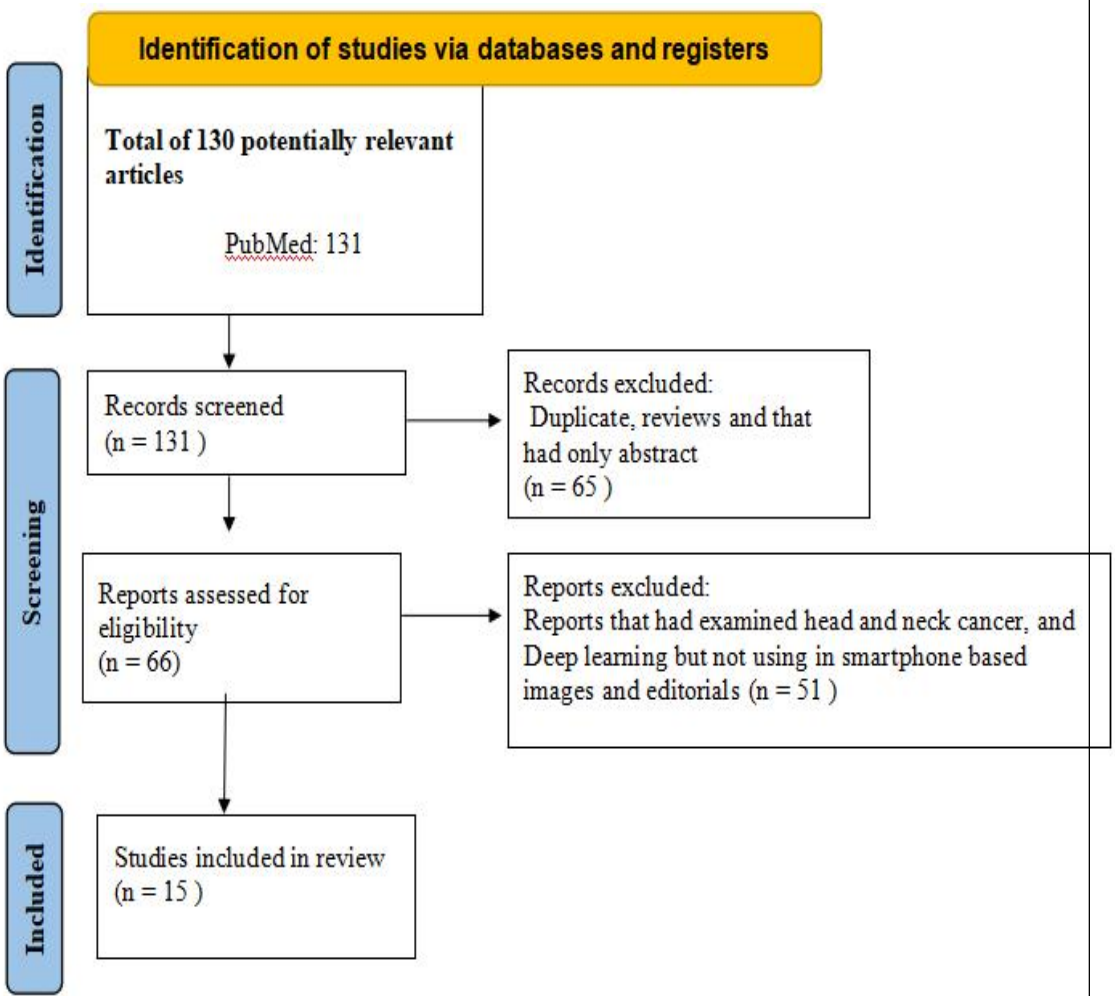

Figure 1: PRISMA flow chart for the included studies

Author	Journal details (Name & year)	Topic	Objective	Conclusion	
Aubrevill e et al.	Pubmed (2017)	Automatic classification of cancerous tissue in laserendomic roscopy images of the oral cavity using deep learning.	To detect oral cancer.	The deep learning offered automatic detection of oral cancer for effective management of the cancer.	Primary Research
Song et al.	PubMed (2021)	Mobile-based oral cancer classification for point-of-care screening	To develop a mobile-based dual-mode image classification method and customized Android application for point-of-care oral cancer detection.	mobile-based approach is effective for oral cancer screening in low-resource settings.	Primary Research
Kim et al.	PubMed (2021)	Automated Detection and Classification of Oral Lesions	Oral cancer survival prediction in patients.	Survival prediction can offer a good approach to properly manage oral	Primary Research

		Using Deep Learning to Detect Oral Potentially Malignant Disorders		cancer.	
Fu et al.	PubMed (2020)	A deep learning algorithm for detection of oral cavity squamous cell carcinoma from photographic images: a retrospective study.	To identify patients with OCSCC	The performance of the deep learning is comparable to an expert and better than medical student.	Primary Research
Camalan et. al.	PubMed (2021)	Convolutional neural network-based clinical predictors of oral dysplasia: class activation map analysis of deep learning results	to develop a deep learning method to classify images as “suspicious” and “normal” and to highlight the regions of the images most likely to be involved in decision-making by generating automated heat maps.	by using convolutional neural network-based clinical predictors, oral dysplasia in an image can be classified accurately in an early stage.	Primary Research

Song et al.	PubMed (2020)	Automatic classification of dual-modalilty, smartphone-based oral dysplasia and malignancy images using deep learning	screen high-risk populations for oral cancer in low- and middle-income countries	Smartphones integrate state-of-art technologies, such as fast CPUs, high-resolution digital cameras, and user-friendly interfaces	Primary Research
Lin, Huiping et al.	PubMed (2021)	Automatic detection of oral cancer in smartphone-based images using deep learning for early diagnosis	To detect effective smartphone-based imaging diagnosis method, powered by a deep learning algorithm, to address the challenges of automatic detection of oral diseases.	The smartphone-based imaging with deep learning method has good potential for primary oral cancer diagnosis.	Primary Research
Uthoff et al.	PubMed (2021)	Point-of-care, smartphone-based, dual-modality, dual-view, oral cancer screening device with neural network classification for low-resource communities.	To distinguish between precancerous and cancerous lesions early.	Effective management of oral cancer through early detection.	Primary Research

Haron et al.	PubMed (2020)	m-Health for Early Detection of Oral Cancer in Low- and Middle-Income Countries	To evaluate the feasibility of using Mobile Mouth Screening Anywhere (MeMoSA®) to facilitate early detection of oral cancer.	MeMoSA has the potential to be used to promote equitable health care and streamline patient management that could result in early detection of oral	Primary Research
Khan S et.al.	PubMed (2020)	Clinical evaluation of smartphone based fluorescence imaging for guidance and treatment of early cancer	To assess the capability of a simple smartphone-based device	A simple smartphone-based approach for imaging oral lesions is shown a a vert useful technique for guidance and treatment of early cancer	Primary Research
Ren et al.	PubMed (2019)	Deep Machine learning in dental, oral and craniofacial imaging	Recent deep learning techniques use in images to detect oral cancer	Deep machine learning helps clinicians in taking decisions which also helps in better treatment of patients	Primary Research
Alabi	PubMed	Machine learning	examined the use of	Artificial neural	Primary

et.al.	(2019)	application for prediction of locoregional recurrences in early oral tongue cancer	artificial neural networks (ANNs) to predict recurrences in early-stage Oral tongue cancer	networks seems to offer a unique decision-making support predicting recurrences and thus adding value for the management of early oral cancer	Research
Chan et al.	PubMed (2018)	Texture-map-based branch-collaborative network for oral cancer detection.	The detection of oral cancer.	The oral cancer was successfully detected.	Primary Research
Kim et al.	PubMed (2018)	Deep learning-based survival prediction of oral cancer patients.	Oral cancer survival prediction in patients.	Survival prediction can offer a good approach to properly manage oral cancer.	Primary Research

Table- Studies include in this review

Smartphone-based images using deep learning for early detection

Smartphone-based imaging using deep learning may be used to identify oral cancer in its earliest stages, according to published studies. Studies included in recent reviews show an increasing trend toward using deep learning in early identification and treatment of oral cancer. Deep learning has been used to smartphone photos in the pursuit of early diagnosis of oral cancer.

Images taken with a cell phone have an accuracy range of 77.89 to 97.51 percent, according to the study (Lin, Huiping et al.). Deep learning models may help identify oral cancer in the future. Smartphone cameras now have higher-quality, lower-noise, and quicker image and sensor technologies than ever before, thanks in part to the widespread use of these technologies. Using a smartphone's white light to take oral photos is an excellent option.(Lin, Huiping et al.).

Oral cancer prediction and diagnosis using deep machine learning seems to be a viable use of this technology. The findings shows that the mobile phone health applications have demonstrated the potential to improve health outcomes and delivery of health services. Use of these mobile imaging systems can increase efficiency of data collection, transmit health information more promptly, improve patient adherence to medications, and enable remote diagnosis.(Haron et al.)

Deep Machine Learning for early detection of oral cancer

Using deep machine learning for early diagnosis of oral cancer was investigated in this systematic study. Oral cancer diagnosis has been improved using deep learning techniques that examine a variety of medical data. Medical imaging data and deep machine learning technology were used in this study to demonstrate that early identification of oral cancer was made possible. With this information, doctors can better treat people with the condition.

Using a single performance measure or the combination of sensitivity, specificity, and accuracy, the deep learning technique's performance has been largely described in the literature. As shown by the included research, it is clear that deep machine learning approaches may play a key role in improving oral cancer

prognostication and guiding doctors in making knowledgeable judgments. A deep learning-based approach to prognostication may give low-cost screening, smartphone-based solutions, deep learning-based autonomous prognostication, and early identification and prediction of outcomes.

There are several ways in which deep learning may help pathologists, for example, in grading multi-class tumors effectively, allowing for prompt and effective treatment protocols to be implemented for patients Through prompt grading, the pathologists' burden may be reduced, and burnout can be reduced as a result. They can also better control illness. In the same way, the deep learning model may classify patients as either high- or low-risk, depending on whether they need a more aggressive treatment plan. These patients' overall survival might be aided by this educated choice, which could reduce the risk of side effects like hormonal problem or dental disease.

Convolutional Neural Network

A typical CNN is made up of input and output layers alongside other important layers such as convolution, max pooling, and fully connected layers. In order to effectively learn more and more abstract qualities from input data, like as an image, these layers are needed. The convolution layer takes the input picture and extracts a feature when it is fed into a conventional CNN. Transferring this characteristic to the pooling layers for further processing. As a final step, the reduced pictures are supplied into the fully connected layer, where they are classified into the appropriate categories and labels.(Aubreville et al.)

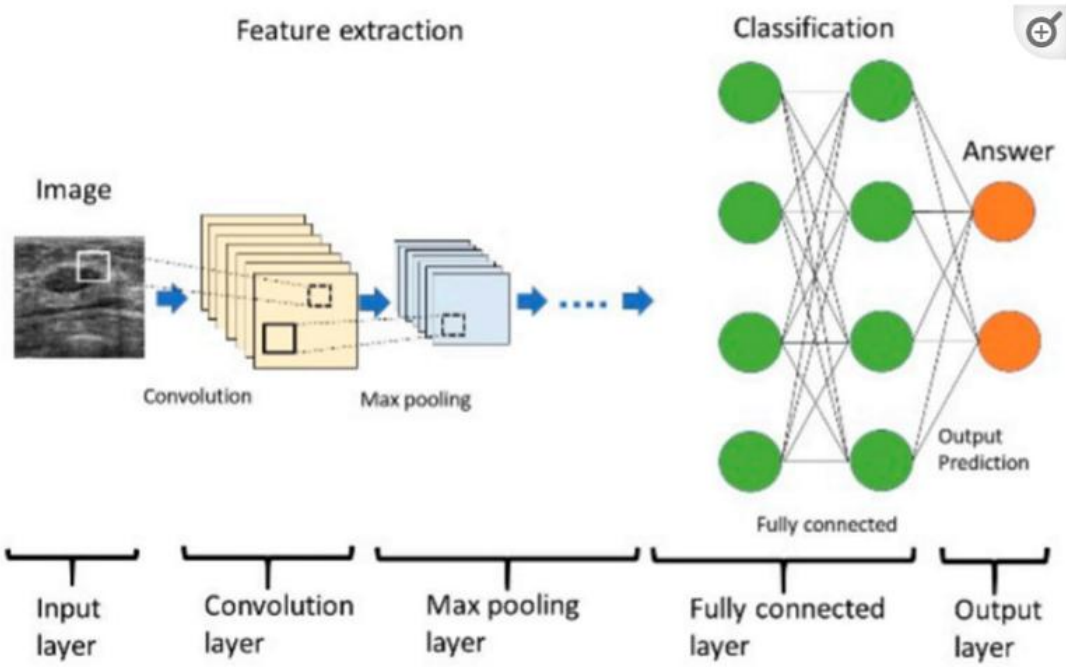

Figure 2.1- The architecture of Convolutional Neural Network

Image-Capturing Method

The focal length of the main camera in a smartphone is commonly short, for example, the iPhone 12 has a wide-angle (only 26 mm) camera. A shorter focal length means a larger field of vision, whereas a longer focal length means more of the scene is recorded. To obtain a picture where the lesion covers the majority of the image, it is impossible since most lesions are minor. As a result, the acquired picture may include a wide range of unrelated background elements. It's possible that various cameras with varying focal lengths, even if they're looking at the same lesion, will provide differing imaging lesion sizes.(Fu et al.)

Because the visual appearance of normal and sick tissue is markedly different in appearance, detecting the location of oral lesions is rather simple for the nonmedical expert. By making use of a camera grid, it is possible to ensure that each region of a lesion is neither too little nor too large in the photographs.

Because of this, the fixed ROI approach may be used without resorting to any region proposal methods or depending on manually cropped ways to crop the discriminative sections and filter out the irrelevant backdrop. The placement of the primary item in a picture helps to increase the performance of CNNs for image identification. (Fu et al.)

Using a camera grid, we can determine whether the lesion is in the middle of the frame, ensuring that the photo is balanced. Anyone with a smartphone camera may do this technique with ease. The basic steps are as follows.

1.Turn on the camera grid within the settings. This will display a faint grid over the capture frame, split into nine rectangles of equal size.

2. Obtain the patient's permission to use the photograph. Use a phone camera to take a picture of a lesion by placing it near the lesion, maintaining it in a square, and then adjusting camera distance to make the lesion's covered area less than the center camera grid area. Once pressed the shutter button, the lesion will be captured on camera.

3. Use a direct line connection or WiFi to transfer the recorded picture to a computer running diagnostic software.

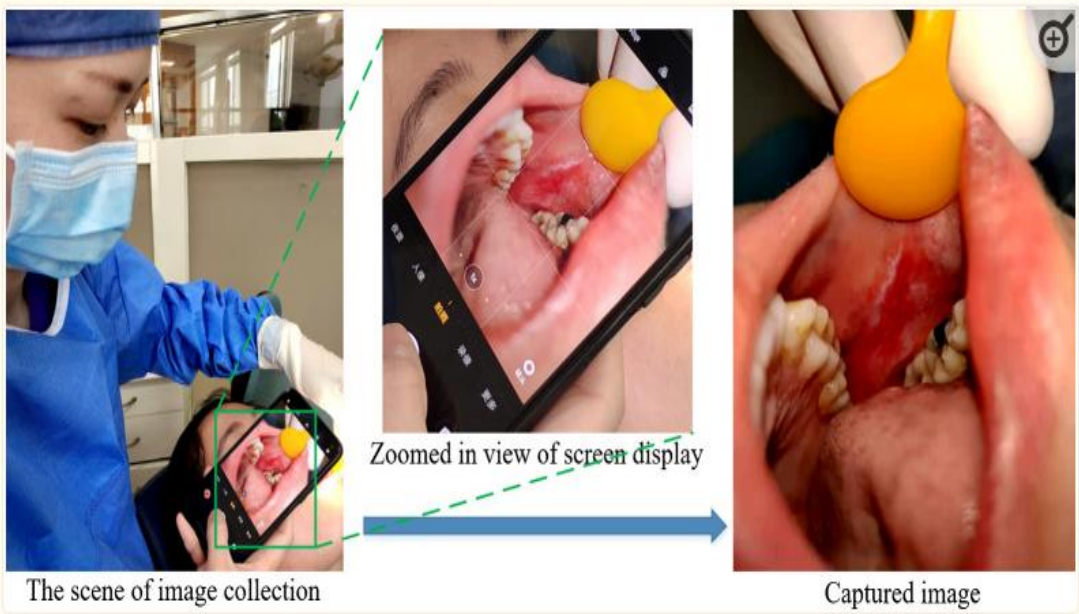

Figure 2.2- Illustration of data acquisition. the image shows a lesion at the center of the region

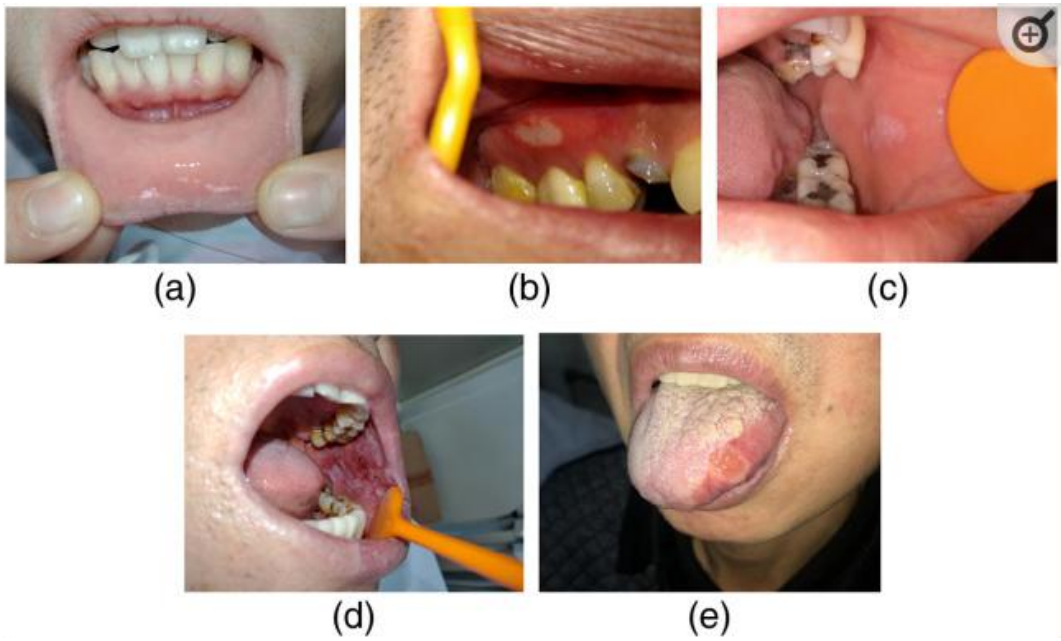

Figure 2.3- Images Capture from Mobile Phone which helps in early detection of Oral Cancer

2.4. Resampling

Using a resampling approach may help reduce the influence of smartphone-generated photos' inherent unpredictability.

Oral pictures may be taken from somewhat varied angles since the image-capturing process is generally focused on each lesion. It's simple to make up for a misaligned picture using image rotation. Each oral picture is rotated in two directions, one at a step size of deg and the other at a step size of deg, as illustrated in Figure-2.4 (a). Images were reduced in size such that just the lesion and relevant information was retained. This shows that the resampling strategy improves the network's performance in diagnosing oral diseases.

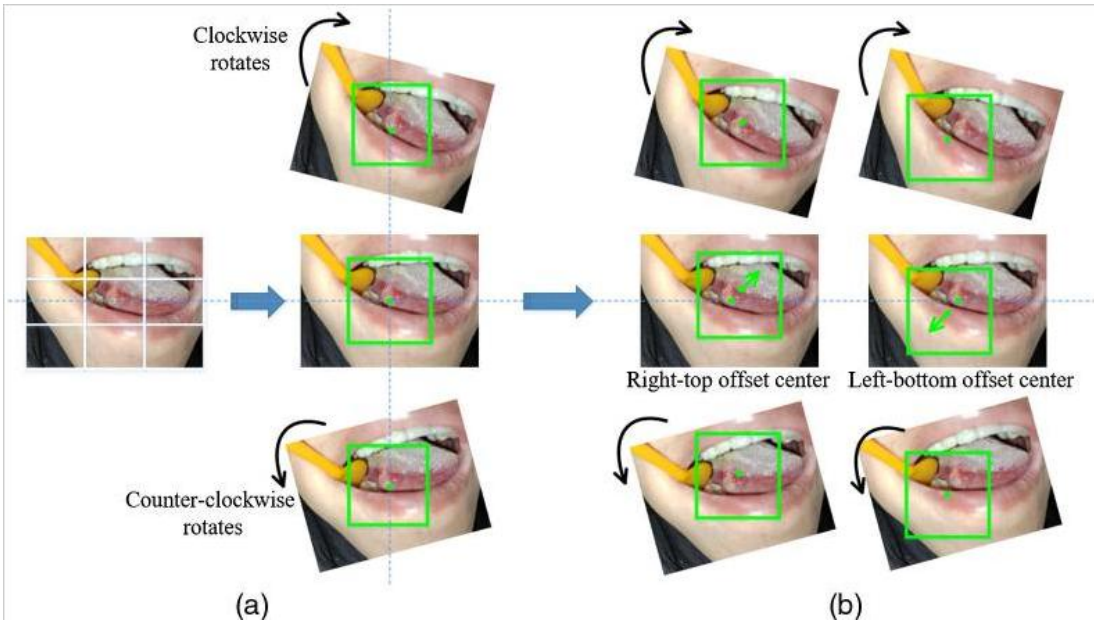

Figure 2.4- The captured image is expanded by an optional offset center of rotation. The green squares mark the cropped areas that will be used to create patches for training. Rotate the image around (a) its center and (b) its offset center.

Importance of Detection of oral cancer at an early stage

Early identification, according to peer-reviewed studies, is a tried-and-true method for preventing cancer deaths. On the other hand, people whose tumors are diagnosed and treated before symptoms manifest may have a greater chance of long-term survival.

When cancer is diagnosed early, the chances of a successful recovery are considerably boosted. If the condition is not recognized in a timely way, the spread of cancer cells will speed, resulting in a rise in morbidity. Lack of early identification and treatment results in an increase in cancer-related disability, which lowers the patient's survival chances.

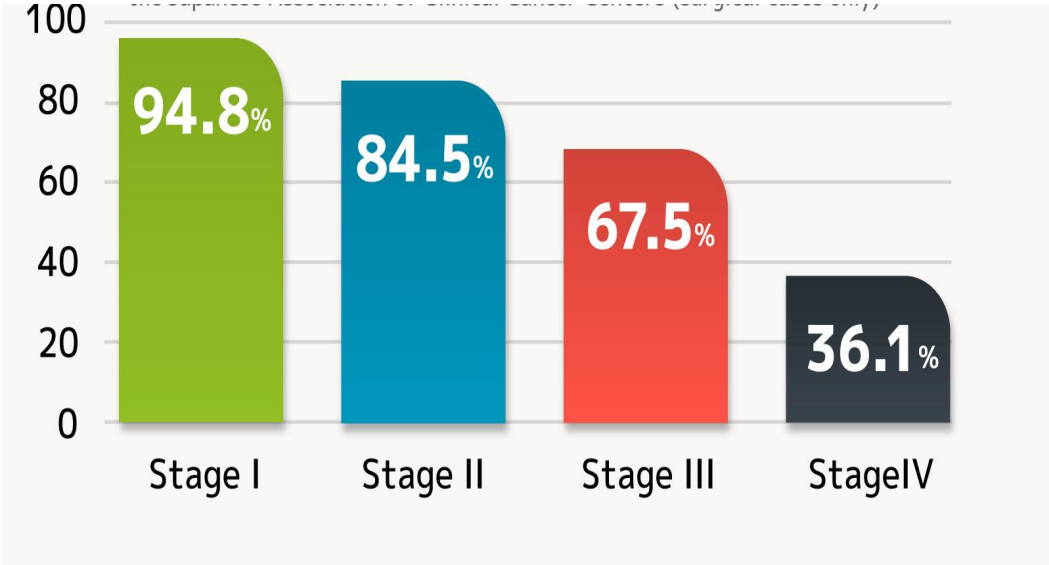

Figure 2.1- 5-year survival rate for oral cancer

To limit the number of people who die as a result of late-stage diagnosis, it is important to encourage early detection. The 5-year survival rate has been shown to be higher in early stage I or II cancers than in more advanced stage III and IV tumors when the cancer is identified (Song et al.). In order to enhance survival, decrease morbidity, and minimize deformity, early detection of oral cancer is the best option.

The chances of a good recovery are greatly increased when cancer is discovered early. The spread of cancer cells will be accelerated if the disease is not diagnosed in a timely manner, resulting in an increase in morbidity. Cancer-related impairment grows as a result of lack of early detection and treatment, lowering the patient's survival prospects.

Oral cancer is discovered in more than half of individuals who already have advanced lesions. As a result, many people are unaware that early diagnosis is critical to improving survival and reducing morbidity as well as the expense of therapy.

Oral cancer is more likely to spread if it is not diagnosed or treated in a timely manner. In the latter phases of oral cancer therapy, there are various

challenges. Removal and reconstruction of the tumor need a complicated surgical technique. Advanced stage oral cancer impacts both life expectancy and quality of life. A worse prognosis and a greater likelihood of nodal metastasis are both related with a diagnosis of a bigger oral cancer.

There is still a lot of anxiety about oral cancer in the public context of health. In both sexes, the incidence has steadily grown over time. In India, early detection and prevention are critical to reducing the illness burden. Patients who are well-informed about the dangers of oral cancer and who practice self-examination and good dental hygiene have a better chance of finding precancerous lesions and having them treated early.

A better prognosis and lower treatment costs may be achieved with the detection of oral cancer at an early stage. In spite of the difficulties of mass screening for primary prevention, patients who seek care at the correct time may benefit from secondary prevention, which includes early diagnosis of invasive carcinomas and their precursor lesions. Disfigurement or social isolation aren't real concerns for patients if they detect cancer at an early stage and get proper treatment.

2.10- Limitation

The main limitation is that deep learning algorithms utilised a variety of data types in their analysis. As a result, it was difficult to draw conclusions about the effectiveness of these deep learning techniques. Additionally, the datasets utilized to train the models in most of the experiments were quite tiny. Most of the deep learning models produced in the published publications were not tested outside of the research laboratory. Currently, there are no published research on the use of machine learning for staging, according to knowledge. It's conceivable that additional study might be done here.

2.11- Conclusion

In conclusion, the use of deep learning for oral cancer prognosis is on the rise. Cancer prognosis may be predicted more accurately using deep learning algorithms. As a result, patients may benefit from treatment that is tailored to

their specific needs. In clinical trials, it has been demonstrated to be as good as, if not better than, the standard of care now used. Improved diagnostic performance, intelligent clinical decision making, streamlined clinicians' labor, a possible reduction in cancer care costs in screening, and an efficient evaluation and monitoring of the illness are all projected benefits of the deep learning approaches. So doctors and patients may spend more time talking and making choices together in order to enhance patient care. Deep learning models that include data from a variety of sources will be critical in the future.

Nowadays, Smartphones are incredibly powerful portable computers that include handy devices such as multi-mega pixel cameras, and they can be found in both developing and developed countries. Making the smartphone, a hand held electronic machine as medical device will help to detect the cancer at early stage and save many lives

2.12- References

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