ANALYSIS ON LEPROSY TREATMENT FOR PREVENTIVE HEALTH CARE: A SURVEY PAPER

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Abstract
Prediction and detection of leprosy is very important and crucial task in healthcare industry. It is necessary and very important to detect and predict at very initial stage as it spreads from one person to another like contagious disease. In this paper we presented an overview of all the existing techniques to detect leprosy at initial stage. Image processing plays very vital role in healthcare industry especially for Leprosy disease. Some widely used medical treatments like MDT, Chaulmoogra Oil, Dapsone Pills are used for leprosy treatment. Leprosy has been misunderstood, it was thought as a punishment from God, and there was a discovery of treatments which cured the leprosy disease. There are few techniques discussed in the paper. In this paper a study is presented in which an analysis is provided for the diagnosis and prediction of leprosy at initial stage using Image Processing .But automated diagnosis system for prediction of leprosy by using image processing techniques, plays an important role in time and performance.

I. Introduction

Leprosy is a constant infectious peripheral neuropathy caused by *Mycobacterium leprae*. Leprosy is a particularly common cause of neuropathy as it is also seen in many countries. Early detection of leprosy and treatment are the most important steps in preventing damage and disability. Thus the early understanding of the clinical leprosy presentation is necessary. The persistent anesthetic skin lesions are absent in the pure Neuritic leprosy presentation form.

The World Health Organization, in 2009, published that 17 countries reported more than 900 new cases, performing 92% of the new globally detected. Some rare cases can be seen in countries receiving migrant from undeveloped countries. It is necessary to guide patients about the condition and the results of neuropathy. Leprosy is transmitted through infected person's respiratory droplets and occurs commonly those living in poverty. Leprosy disease as its name taken from Latin word Lepra.

Leprosy also known as Hansen's disease was named after the physician Gerhard Armauer Hansens. Leprsoy people were separated in other colonies as to stop spreading the disease and it occurs in places such as India, China and Africa. The word "Leper" was used for the persons affected by the leprosy. To create awareness for the leprosy disease, World leprosy Day was started in 1954.

Many people believe is leprosy arriving in an Egyptian document written between 1550 B.C. Around 600 B.C. All over its history, leprosy has been misunderstood. It was thought as a punishment from God. After the discovery of its biological cause, leprosy patients were avoided. In Europe, Leprosy patients had to wear different clothing and to hide their disease in different ways.

In modern times leprosy had their own colonies to stay and they are called as Leprosariums. Leprosy has been so common in various areas as certain times throughout history that is has encouraged art work and changed other cultural practices.

The history of Leprosy is one of the suffering and misunderstood by everyone. The very most written reference to disease was found in Egyptian. The disease was well identified in ancient China, Egypt, and India. It was not easy to understand the disease and was very slow to show symptoms. It was known as a Curse from the Gods. Leprosy was has to be treated by physicians but it was left over to holy men

The disease often came in family members; some people thought it was genetic. Some people noted that if there was little or no contact with infected people, the disease did not infect others. Therefore, some cultures considered patient as "impure" and managed they could not associate with hygienic people. Often infected people had to wear special costumes so numbness is the first symptoms to be seen in leprosy. As the strength of leprosy increases, deep pressure are lost, sensation of touch and pain are decreased. It can also cause eye damage which reduces blinking. This symptom continues on the cooler areas of the body like hands, feet, face and knees.

The symptoms differ, depending on the types of leprosy. The most common type is sensory neuropathy. Mono neuropathy, mono neuritis multiplex, Symmetric peripheral Neuropathy are also the other types of leprosy

II. Related Work

1) In 1873, Dr. Gerhard Armauer Hansen [1] identified the germ that causes Leprosy. He holds the position of medical officer for leprosy in Norway and made many changes for controlling leprosy. The first law for leprosy was passed in 1877 and poor people were moved from farm to farm. There was a violent opposition among some circles during the second leprosy law in 1855.He hold many positions on medical societies and founded medical publications and contributed for Lepra an International journal of leprosy.

2) In early 20th century, The Chaulmoogra oil [2] was used by doctors all over the world to treat leprosy patients. The Chaulmoogra oil was introduced by British Physician Frederic John Mouat in 1854.He took his medical degree at Edinburgh in 1839.The Indian medical service served for 30 years. Mouat was professor at Bengal Medical College and during this period he became first to get familiar with chaulmoogra oil .In 19th century, Chaulmoogra oil entered Western medicine but it is used in other areas for different skin conditions for hundreds of years. The discovery of oil against leprosy was based on Burmese folklore.

3) In 1921, Gillis W. Long Hansen's disease center[3] was established by U.S Public Health service in Carville, Louisiana and was also known as Carville. The Carville facility became the first center and home for the leprosy patients which are named after a United states Congressman Known as Gillis W. Long and was closed in 1988 after 104 years .The Carville buildings were shifted to the state of Louisiana in 1998 and it remains open to the public.

4) In 1941, at Carville, Promin[4] named sulfone drug was first identified and used as a treatment for Leprosy. It was found to be successful treatment but it required painful injections. The invention of Promin a sulfone drug was shown to successfully cure leprosy in 1941 and it was known as the "Miracle of Carville". In 1950 Dr. R.G. Cochrane discovered dapsone pills which became popular treatment for leprosy.

5) In 1970s, Multi-drug treatment [5] was found to be successful for leprosy treatment and it was developed through drug experiment on Malta Island. The MDT coverage statistics were analyzed during the period 1989 to 1994.The defined MDT coverage was implemented and whole district was considered to be under MDT. The figures reported that all registered patients in district were treated by MDT and most patients continued with dapsone Monotherapy. In India, information collected that after 1998 all patients were treated by MDT.

Type of Leprosy	Daily, Self-Administered	Monthly Supervised	Months of Treatment
Paucibacillary	Dapsone 100 mg,	Rifampicin 600 mg	6-12
Multibacillary	Dapsone 100 mg,	Rifampicin 600 mg,	24
	Clofazimine 50 mg	Clofazimine 300 mg (WHO); 200 (NHPP)	
Pediatric	Dapsone 2 mg/kg,	Rifampicin 10 mg/kg	Same as in adults
	Clofazimine 1 mg/kg	Clofazimine 6 mg/kg	

Table 1: Multidrug Therapy Plan Recommended by the WHO [7]

WHO Region	Estimated Cases	Registered Cases	Registered prevalence Rate / 10000	Cases Detected	Detection Rate per 10000	MDT Coverage %	Cured with MDT(Cumulative Total)
Africa	219000	113650	2.12	47900	8.92	80.6	384 981
Americas	219000	195891	2.61	36623	4.94	65.9	222 233
Eastern	61000	23219	0.55	6504	1.53	81.5	48218
Europe	6000	4916	0.06	NA	NA	47.4	2134
South East Asia	1259000	913664	6.72	456882	33.62	76.4	5825151
Western Pacific	70000	40508	0.25	12737	0.79	97.7	204 472
Total	1834000	1291848	2.33	560646	10.13	76.2	6 687 189

Table 2: Leprosy Prevalence (1995), MDT Coverage (1995), and Case Detection (1994) By WHO Regions [7]

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6) In 1981, the combination of Dapsone, Rifampicin, and Clofazimine was recommended by world health Organization and was found to be best treatment.MDT with these drugs combination takes a year or even more, depending on stage of leprosy infection. Now unfortunately, the leprosy disease was poorly understood and it was left to be treated by the priests instead of getting treated by physicians.

7) In 1982 -1985- There was introduction of MDT on a global basis. In 1986 -1990, Expansion strategy for MDT into the less difficult areas. In 1991-1999, there was elimination strategy. From 2000 onwards extensive elimination strategy was designated.

III. Symptoms of Leprosy

A rod-shaped bacillus which grows inside some humans and animal cells and it is known as Mycobacterium leprae bacterium which causes leprosy. It has red on a blue background content in its cell walls due to mycolic acid. These bacteria takes almost very long time to reproduce inside of cells about 14 days and these bacteria tend to be develop the infection inside cooler areas of body.

The symptoms of leprosy occur slowly and usually over years. The loss of temperature sensation and numbness are the first symptoms to be seen in leprosy. As the strength of leprosy increases, deep pressure are lost, sensation of touch and pain are decreased. It can also cause eye damage which reduces blinking. This symptoms continues on the cooler areas of the body like hands, feet, face and knees.

The symptoms differ, depending on the types of leprosy. The most common type is sensory neuropathy. Mono neuropathy, mono neuritis multiplex, Symmetric peripheral
Neuropathy are also the other types of leprosy
Symptoms of leprous neuropathy include the following [6]:
- Nonitchy skin patches, anesthetic, painless.
- Abnormality due to weakness animate by the afflicted peripheral nerves.
- Trophic ulcers and Impromptu blisters consequent to sensory loss.
- Neuralgic pain when the nerve is struck, abate to complete loss of sensation and paresthesias in the circulation of damaged nerves are Sensory symptoms.

Symptoms seen in leprosy reactions are as follows:
- Reversal reaction – Immediate onset of burning of the skin and arrival of new skin abrasion.
- Erythema nodosum leprosum - Various skin nodules fever, joint pains, muscle pains, and burning of eyes, expeditious severe neuritic pain and growth of peripheral nerve damage, resulting in claw hand or foot drop. Comparison of Reversal Reaction and Erythema nodosum leprosum Reactions.

Features	Reversal Reaction	ENL Reaction
Leprosy type at risk	BL, BB, BT	LL, BL
Onset	Gradual, over a few weeks	Sudden
Sudden Clinical symptoms and signs	Malaise	Fever, Malaise, Arthritis, Edema, Hepatosplenomegaly, lymphadenopathy, Rchitis, Iridocyclitis
Skin lesions	Increased erythema, induration of pre existing lesions, and appearance of new lesions	New erythematous lesions or tender nodules on face, extremities, and trunk
Nerve involvement	Frequent, often severe	Frequent, often severe

Table 3.Symptoms Seen in Leprosy Reactions [6]

IV. Detection Techniques

1) Technique called feed Forward back Propogation neural network[8] is used for the pre-processed images and use to trained the resulted images.There are various technique used for converting image of the infected area and after that to image sharper ,sharpening filter is used.As every image has noise and it is removed with the help of median filter

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technique Pixel value in an image is replaced with the value in an image with the average value of its neighbours. Distribution of colour of binary image is showed by histogram. To extract the average colour code of infected area from the binary image YCbCr is used and with help of sobel operator, image is detected edge of the infected area.

Disease Name	Sample image	Elevation (cm)	Total image	Disease detected	Detection rate %
Leprosy		1-7	24	20	89%

Figure 1: Image Processing

2) There is a set of electronic fingerprint sensors based on scanning technology[9].It is done with the help of optical, capacitive sweep technology and capacitive touch technology .It is necessary to know the level of skin disease and its influence with the help of specific fingerprint acquirement method. There are some methods with the help of which analysis is done using dactyloscopic paper and card, dactyloscopic paper.
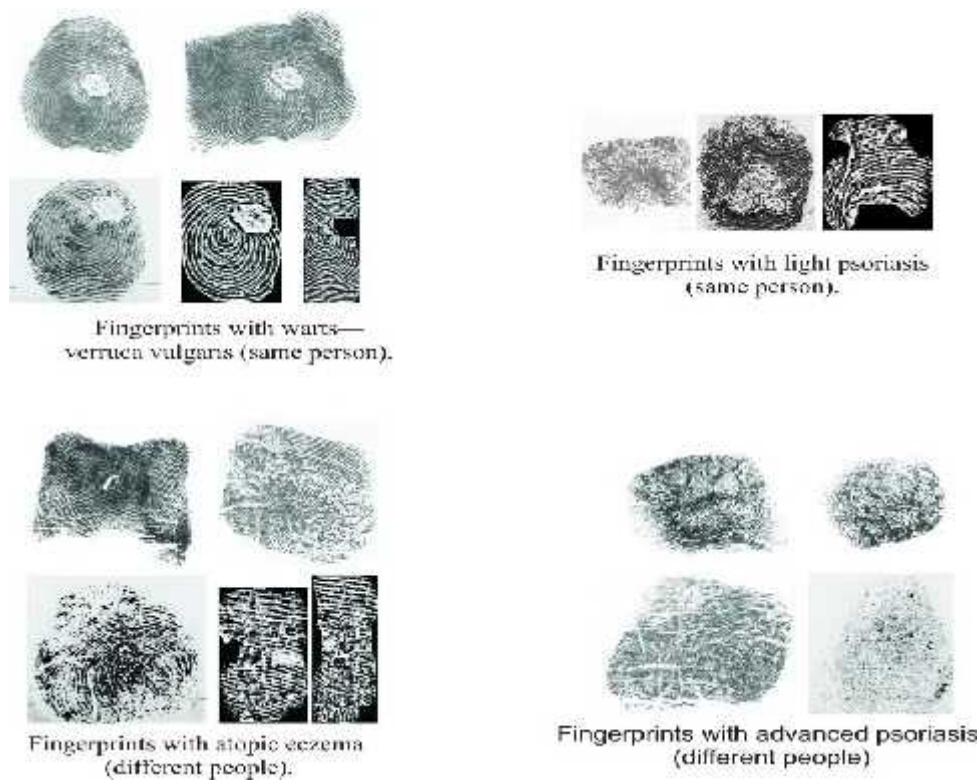

Fingerprints with warts— verruca vulgaris (same person).

Fingerprints with light psoriasis (same person).

Fingerprints with atopic eczema (different people).

Fingerprints with advanced psoriasis (different people)

Figure 2: Finger Print Recognition

3) Acquisition and processing of low-contrast, barographic images of skin is done [10]. These technique is useful for the information regarding internal structure and changes in foot and also used to detect risk of ulcer development in leprosy. Grey scale image, combined image of walking and paths of centers of pressures and its variations of Patterns are used.

4) It is a main clinical procedure that is commonly needed for the his to pathological analysis of leprosy and importance for appropriate his to pathological classification [11], effect of treatment response. It is also necessary for separating a relapse from a reversal feeling. Incisional biopsy, Incisional biopsy and Shave biopsy are three types of skin biopsy.
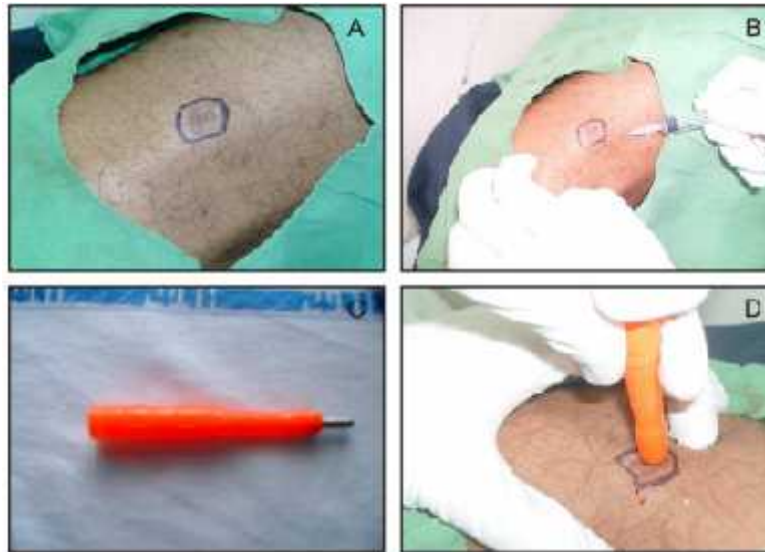
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Figure 3: Skin Biopsy in Leprosy

V. Summary

The Chaulmoogra oil and in 1921, Gillis W. Long Hansen's disease center helped in changes for the treatment for Leprosy. There were many changes after the discovery of MDT Treatment and many strategies were involved for it. At Carville, Promin named Sulfone drug was the first used as a treatment for Leprosy and it was found to be successful.

S. No	Title	Author	Datasets	Methodology	Performance
1.	Dermatalogical Disease detection using Image processing and Artificial neural network	Rahat Yasir, Md. Ashiqur Rehman and NovaAhmed	Grey Scale Image, Median Filter, Sharpening Filter.	Forward back Propogation neural network is used for the pre-processed images and use to trained the resulted images	Accuracy 89%
2.	Influence of Skin disease on Finger print Recognition.	Martin Drahansky, Michael dolezel, Jarsolav Urbanek, Eva Brezinova, Tai-hoon Kim	optical, Capacitive sweep Technology	Scanning technology	Accuracy 20-25%
3.	New-Image Processing system for analysis, display and measurement of static and dynamic foot pressures	K.M Patil, M.S Srinath	Monochrome ccd Or video camera IBM-Compatible PC/AT	Barographic images of skin is done	Low
4.	Skin Biopsy in leprosy	Avinder singh, Xiaoman weng, Indira Nath	hypodermic needles for image transmission	Incisional biosspy, Punch biopsy, Shave bisopy	Low

Table 4: Summary

VI. Conclusion

In this paper the analysis is presented for leprosy and their related work area till now. Many techniques have been employed

in recent years for the prediction of leprosy at initial stage. In this paper an overview of medical treatment of leprosy from initial stage. There are few techniques discussed in the paper such as Image processing techniques like Grey scale image, sharpening filter, median filter are used. Finger print recognition with optical, capacitive sweep technology are used. Image processing is also done through video digitizer using video camera is used for barographic images of skin. Skin biopsy is done through needles for image processing and methods like Incisional, Punch and shave biopsy are involved.

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