Detecting the Disease before it's Too Late

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

Short Communication

ABSTRACT

Specific trials or examination exists in detecting deadly diseases. Various facilities are provided these days for determining many chronic diseases, like in detecting cancer, tuberculosis, keratin level (dialysis), coronary artery disease, etc.   But delaying in diagnosing emergency cases which need very quick action will lead to adverse situations. The process of this early detection of disease starts with a special test and further process depends on the special test result whether it is positive or negative. The sad reality of modern technology in the medical industry is that there is very less availability of vanguard doctors, who can help patients in diagnosing their disease, which can be treated successfully as soon as possible diagnosis has been done. Therefore, Hong Kong University (HKU) scientists discovered "Biomarker" which is being rapidly used by physicians, Neuroscientists and epidemiologists in measuring the intensity of disease provided with the details of its cause and treatment. Biomarkers possess possibilities in making wishes of doctors and scientists into reality, to identify that person who is at high risk of any disease so that doctors can take protective measures in saving that life within time. Nevertheless, according to Global data "Biomarkers" are a useful instrument in examining COVID-19 vaccine and fastening the process of clinical trials, decreasing the development cost and decreasing patient security risk. They also can be utilized to find the drug which can help in treating Covid-19 patients and can also be used to determine which drugs might be able to treat COVID-19 patients.

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1. INTRODUCTION

It is quite understandable that delaying in diagnosing serious illness will lead to adverse situations, which compiles disease treatment to reduce their work less and also decreases the chances of patient's survival. According to a survey in India, 12.5% of people come in the initial stage for the treatment for their disease and around 70% of the death is due to late detection of cancer [1,2]. Hence early discovery of serious diseases offers chances for increasing curing and survival rates. Early discovery of disease means that the disease is determined when the person shows no sign /symptoms of that particular disease. Various facilities are provided these days for determining many chronic diseases, like in detecting cancer, tuberculosis, keratin level (dialysis), coronary artery disease, etc. (Table 1). Generally, earlier tests of diseases are considered till 2nd stages. The process of this early detection of disease starts with a special test and further process depends on the special test result whether it is positive or negative.

If the result comes positive, then the patient is taken for a definitive test which is different from a special test, this test is important to confirm the presence/absence of disease in that patient. For many types of cancer, biopsy is carried out as a definitive test. Special test for diagnosing cancers such as; prostate specific antigen test for detecting prostate cancer, pap smears for detecting cervical cancer, mammography for

detecting breast cancer. In cases of tuberculosis and blood pressure as well as in cases of cardiovascular disease, X-ray is done to detect the disease. According to reports from the World Health Organization, cancer is reported as the second most popular reason for deaths all over the world with an estimate of 9.6 million deaths in 2018. The cause of one-third cancer patient is due to high body weight, less physical workout in day to day life, smoking and drinking. Among these factors 22% people suffer from cancer due to intake of tobacco [3].

Table 1. List of chronic diseases [3]

S.no	List of chronic diseases
1	Alzheimer's Disease
2	Arthritis
3	Asthma
4	Cancer
5	Chronic Obstructive Pulmonary Disease (COPD)
6	Cystic Fibrosis
7	Diabetes
8	Heart Disease
9	Reflex Sympathetic Dystrophy (RSD) Syndrome
10	Osteoporosis

This graph is showing various types of cancer reported by WORLD HEALTH ORGANISATION in 2018 with the ratio of people suffering from cancer to how many died because of it, which makes this disease second most cause of death globally (Fig. 1).
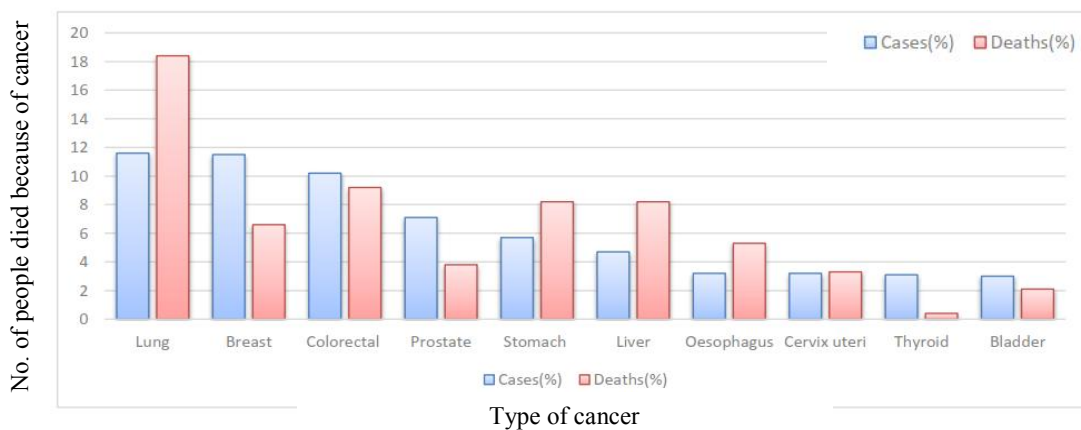

Fig. 1. Most common cases of cancer (2018) [3]

1.1 Heart Attack

Similarly, there are some other emergency cases which need very quick action otherwise it will become life threatening like in case of heart attack also known as myocardial infarction, which occur due to loss of blood supply to heart veins because of blockages due containment of fat, cholesterol, etc., which results in the formation of plaque, that forms a clot in the arteries and blocks the blood flow [4,5]. There is a huge difference between how a Heart attack or a cardiac arrest occurs. In cardiac arrest the heart stops functioning completely while in heart attack the person will only feel some kind of pain in the chest, if not treated or detected, a timely heart attack can lead to cardiac arrest.

1.1.1 How can we find that these are warnings of a Heart attack?

We can recognize from the following signs of an emergency situation:-

- When there is some feeling of tightness, pressure, pain in the chest.
- A kind of pain that reaches to various body parts such as arms, back, neck, or jaw.
- Experiencing some kind of squeezing or weight in the chest.
- When a feeling of heartburn or acidity.
- Feeling vomiting or sometimes nausea.
- A feeling of sticky or sweaty.
- Panting out of breath
- Feeling dizziness
- Sometimes it can be similar to anxiety.
- Coughing or panting

Sometimes signs of heart attack in males and females experience it differently. In the case of women, the possibility of survival is less after suffering from heart attack. It is kind of a heart attack with abnormal symptoms which they start experiencing many weeks before such as:

1.1.1.1 Chest pain

It is the most usual sign of a heart attack, a feeling of squeezing or tightness.

1.1.1.2 Extreme fatigueless

It is a feeling they start experiencing a few weeks before heart attack, in which our energy seems drained out after doing small work.

1.1.1.3 Weakness in body

This symptom mostly found in females i.e. feeling of weak or fragile in body.

1.1.1.4 Out of breath

Sometimes women experience breathlessness while lying down.

1.1.1.5 Drenching

Covered with cold sweat without any physical workout or weather condition is the symptoms of heart attack.

1.1.1.6 Sleep disruptions

Nearly half of the women suffered reported this symptom before heart attack [6].

1.2 Cardiovascular Disease

CVDs which is commonly known as cardiovascular disease is a collection of disorders (heart and arteries) and world no 1 cause of deaths with a ratio of 17.9 million per year. According to researches done so far, out of 5 types of CVDs 4 of them occur due to strokes and heart attacks. Worldwide people are struggling to minimize the threat of CVD, but some are still unknown to the fact that they are suffering from the high probability of it. It has been observed that several no of heart attacks can be stopped by just controlling highly risk factors which in turn depends on changing your lifestyle like smoking, unhealthy eating and drinking, intake of alcohol, high blood pressure, sugar and cholesterol and taking drug dozes where necessary for it [7].

1.3 Insufficiency of Screening Tests

Screening is basically done to identify a person with suggested abnormalities found without developing any symptoms and directly sends it to determine the disease and treatment. The sad reality of modern technology in the medical industry is that there is very less availability of vanguard doctors, who can help patients in diagnosing their disease, which can be treated successfully as soon as possible diagnosis has been done.

For example in case of cancer, types of screening test that are being used such as mammography for detecting breast cancer in

females shows false positive rate due to lack in examining dense breasts and prostate-specific antigen (PSA) blood test in males to detect prostate cancer which measures [8] the amount of prostate-specific antigen (PSA) protein produced by both cancerous and noncancerous tissue in the prostate in the blood. Similarly there are many other diseases which do not have efficacious screening tests.

1.4 Biomarkers

The expression "biomarker", also known as biological marker alludes to a general subcategory of clinical signs – that is, recognized as a clinical state seen from the external condition of the patient – which can be estimated accurately and precisely (Fig. 2). Clinical indication remains rather than clinical symptoms, which are restricted to those signs of wellbeing or sickness saw by patients themselves. There are a few more exact meanings of biomarkers written theoretically. According to the National Institutes of Health definition biomarker is "a characteristic that is estimated and assessed as a marker of ordinary biological cycles, pathogenic cycles, or pharmacologic reactions to a remedial intercession." A joint endeavor on compound safety, driven by the World Health Organization (WHO) and as a team with the United Nations and the International Labor Organization, has characterized biomarker as "a substance, structure, or cycle that can be estimated in the body and impact or anticipate the occurrence of result or sickness" [6,9]. WHO has expressed that a genuine meaning of biomarkers incorporates "practically any estimation mirroring collaboration between a natural framework and a possible danger, which might be substance, physical, or organic. The utilization of biomarkers, and specifically lab estimated biomarkers, in clinical exploration is to some

degree fresher, and the best ways to deal with this training are as yet being created and refined.

1.5 Use of Biomarkers during covid-19

On 31 December 2019, Wuhan, China, first identified a cluster of extraordinary pneumonic events. Later on it was identified as a new coronavirus (SARS-CoV-2) infection called COVID-19. In all 213 countries and territories the pandemic has now expanded to more than 738.600 people among 20.2 million people affected. The spread of the disease has been so rapid that we have found it impossible to organize and successful responses from our population, public health personnel, medical practitioners, scientists and government officials. Many countries have adopted radically different but successful approaches to control the virus from full lock-down, social distance strategies to stop consumption of the country as a result of the coronavirus epidemic. Though this virus and its effects could not entirely be avoided, we may use biomarkers as a valuable method to respond to the needs of the on-going COVID 19 epidemic (for identification, diagnosis, care, and prevention). During our present pandemic, the use of biomarkers is especially important because they can increase the production and acceptance of new, novel medicinal products and biological products, notably vaccine products [10].

The graph is showing the probability that the biomarker's clinical trials went successful in detecting and treating disease (Fig. 3). Often therapies fail due to lack of efficiency in clinical trials. However, some of the reason for this cause is due to inadequate target selection during the drug development period, the fact that only some patients respond to drugs while others do not becomes increasingly apparent.
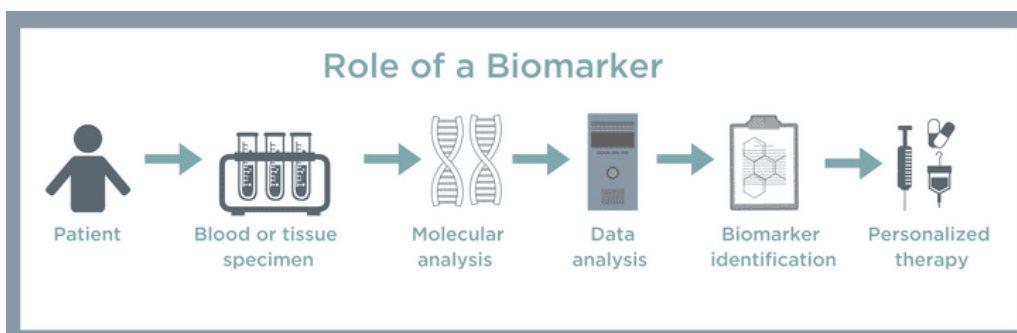

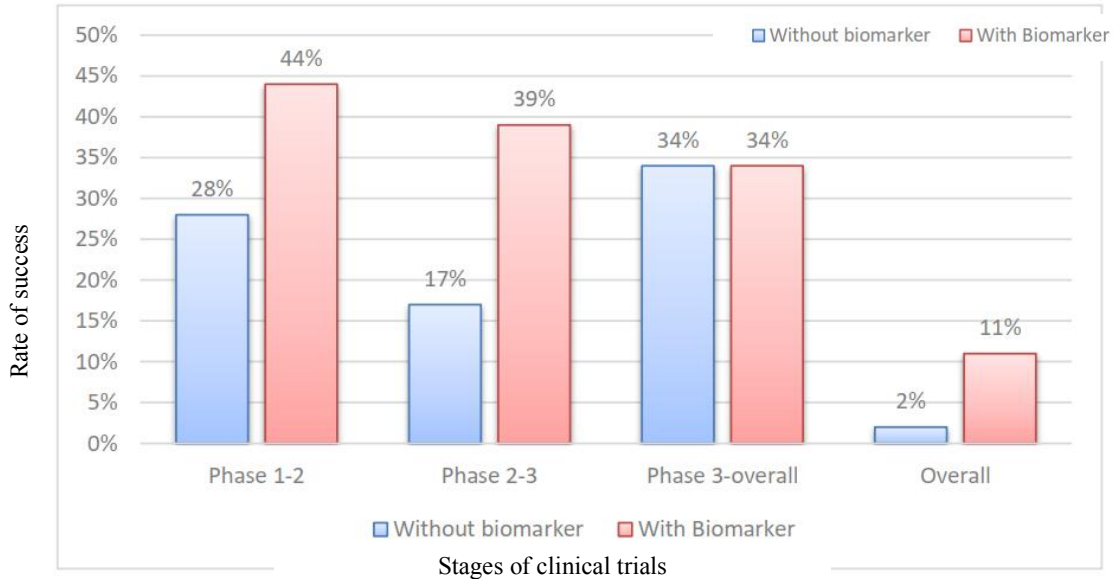**Fig. 2. Role of biomarker in medical science and technology [9]**

Fig. 3. Probability of clinical test done [11]

2. LITERATURE REVIEW

S. Lee et al. in their research paper titled "Early detection of disease and scheduling of screening examinations," explained the definition of early discovery of disease which means that the disease is determined when the person shows no sign /symptoms of that particular disease. They also gave a few examples of Special test for diagnosing cancers such as; prostate specific antigen test for detecting prostate cancer, pap smears for detecting cervical cancer, mammography for detecting breast cancer. In cases of tuberculosis and blood pressure as well as in cases of cardiovascular disease, X-ray is done to detect the disease [1].

Authors in their web article titled "Biomarkers Detect Disease before It Is Too Late," shares that in diabetes biomarkers will indicate the initial stage of disease before it shows in the level of testing glucose, which is considered as a conventional method to detect diabetes. This early detection of diabetes with the help of biomarkers helps patients to cure his /her disease by implementing changes in their lifestyle after consulting a doctor [9].

According to a survey conducted which says that 12.5% of people come in the initial stage for the treatment for their disease and around 70% of the death is due to late detection of cancer [3]. R. N. — W. by J. L. and medically reviewed by Gerhard Whitworth in the Medical News today newspaper titled "What are the signs of heart attack in a woman?", suggested their views that sometimes signs of heart attack in males and females experience it differently. In the case of women, the possibility of survival is less after suffering from a heart attack. It is kind of a heart attack with abnormal symptoms which they start experiencing many weeks before such as:-Chest Pain, Extreme Fatigueless, Weakness in body etc. Also, Cancer is reported as the second popular reason for deaths all over the world with an estimate of 9.6 million deaths in 2018 [4].

WHO in their web article titled "Cancer," shares the information on screening which is basically done to identify a person with suggested abnormalities found without developing any symptoms and directly sends it to determine the disease and treatment [5]. K. Strimbu et al. in their research paper titled "What are biomarkers?," discusses about the expression "biomarker", also known as biological marker alludes to a general subcategory of clinical signs – that is, recognized as a clinical state seen from external condition of the patient – which can be estimated accurately and precisely. Clinical indication remains rather than clinical symptoms, which are restricted to those signs of wellbeing or sickness saw by patients themselves [6].

R. Mayeux, in his research paper titled "Biomarkers: Potential Uses and Limitations,"

tells that numerous investigations utilizing biomarkers never accomplish their maximum capacity due to the inability to match to the equivalent decide that would apply for the utilization of factors that are most certainly not natural as no diagnostic instrument is 100% accurate. The improvement of any biomarker ought to go before or go in corresponding with the standard plan of any epidemiological venture or clinical preliminary [7].

According to Global data in their web article "Biomarkers heavily used as diagnostic tools in COVID-19 trials," shares that "Biomarkers" are a useful instrument in examining COVID-19 vaccine and fastening the process of clinical trials, decreasing the development cost and decreasing patient security risk. The two top biomarkers which are being used in Covid-19 examination are Severe Acute Respiratory Syndrome Coronavirus 2 and Corona virus Nucleic Acid which is diagnostic biomarkers used in 30% and 5% Covid-19 examination. They also can be utilized to find the drug which can help in treating Covid-19 patients and can also be used to determine which drugs might be able to treat COVID-19 patients [8].

3. MATERIALS AND METHOD

The right patient is an effective way to improve opportunities for progress in taking new treatments into clinical trials and to the consumer, focusing on biomarkers – a technique known as precision medicine. The use of biomarkers in early trials will also guide choices about how to improve the probability of success in later trials.

3.1 Types of Biomarkers

3.1.1 Detective biomarkers

This type of biomarkers find biomolecules connected to that particular disease. For example to detect prostate cancer, prostate specific antigen is used as a biomolecule to identify.

3.1.2 Diagnostic biomarkers

This type of biomarkers is used to recognize people suffering from that particular disease. For example, rheumatoid factors in the blood differentiate a person suffering from which type of arthritis.

3.1.3 Prognostic biomarkers

This type of biomarkers depicts the development of disease with or without remedial intercession.

3.1.4 Predictive biomarkers

This type of biomarkers center on the danger factors for specific infections and help recognize those people who are in the beginning phases of the illness and might profit by restorative intercession.

4. RESULTS AND DISCUSSION

HKU scientists discovered "Biomarker" which has been used by physicians, Neuroscientists and epidemiologists in determining human diseases at early stages such as cardiovascular disease, genetic disorders, cancers, kidney disease etc. Uses of biomarkers are rapidly increasing in measuring the intensity of disease provided with the details of its cause and treatment. Biomarker helps in determining prodromal symptoms (it is an initial sign/ symptom which indicates the beginning of disease before any other symptoms develop). Also the prodromal period is known as the first stage of disease. Therefore, biomarkers work as a marker which indicates biological characteristics that define either a subclinical indication, phase of the problem, or a proxy sign of the illness.

The expected usage of this class of biomarkers include: distinguishing proof of people bound to get influenced or who are in the "preclinical" phases of the sickness, decrease in illness heterogeneity in biological preliminaries or epidemiologic investigations, impression of the general history of infection incorporating the periods of acceptance, idleness and recognition, and focus for a clinical preliminary. The improvement in legitimacy and accuracy far exceed the trouble in getting such tissues from patients. The two important types of biomarkers which are offering great advantages in medical science are biomarkers of exposure and disease. Biomarker of exposure is used to find the risk prediction whereas biomarker of disease is used to determine and monitor the progress of disease.

It has been observed that biomarkers have the ability to figure various neurological diseases at an initial stage and provide a way for disease's homogenous classification. Therefore,

Neuroscientists are also dependent on Biomarkers to help them in detecting and treating neural disorders with their causes. Diseases such as diabetes and CVDs become incurable once they reach an extreme stage which leads to death. Therefore, scientists are continuously researching to find the solution in developing Biomarkers so that they can detect disease at an early stage and its effect can be reversed to normal stage. Also, identify that person who is at high risk of any disease so that doctors can take protective measures in saving that life. This wish of doctors and scientists can be fulfilled because Biomarkers possess these possibilities in making it a reality for them, as it has the ability to detect the disease by sending the information directly from blood before any visible symptoms appear to the patient. For example, in diabetes biomarkers will indicate the initial stage of disease before it shows in the level of testing glucose, which is considered as a conventional method to detect diabetes. This early detection of diabetes with the help of biomarkers helps patients to cure his /her disease by implementing changes in their lifestyle after consulting a doctor.

5. CONCLUSION

Nowadays, we are often listening about "Biomarkers" in the biological and medical research, health segment of newspapers in both offline and online mediums. Biomarkers perform an important part in improving the medication improvement measure, just as in the bigger biomedical exploration endeavor. Understanding the connection between quantifiable organic cycles and clinical results is fundamental to growing our armory of medicines for all infections, and for developing our comprehension of ordinary, sound physiology. The need of utilizing biomarkers as substitute results in enormous preliminaries of deadly illnesses, for example, CVDs and cancer, has been broadly talked about above in paper.

Biomarkers could possibly fill in as evident substitutes for clinically diagnosing test for particular diseases (definitive or special test). Nevertheless, according to Global data ``Biomarkers" are a useful instrument in examining COVID-19 vaccine and fastening the process of clinical trials, decreasing the development cost and decreasing patient security risk. The two top biomarkers which are being used in Covid-19 examination are Severe Acute Respiratory Syndrome Coronavirus 2 and

Corona virus Nucleic Acid which is diagnostic biomarkers used in 30% and 5% Covid-19 examination. They also can be utilized to find the drug which can help in treating Covid-19 patients and can also be used to determine which drugs might be able to treat COVID-19 patients.

Numerous investigations utilizing biomarkers never accomplish their maximum capacity due to the inability to match to the equivalent decision that would apply for the utilization of factors that are most certainly not natural as no diagnostic instrument is 100% accurate. The improvement of any biomarker ought to go before or go in corresponding with the standard plan of any epidemiological venture or clinical preliminary.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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