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Investigating the Relationship between New Diagnostic Technology and Information Technology in Diagnosing Cancer: Focusing on Breast Cancer

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Authors' contributions

This work was carried out in collaboration among all authors. Authors NF, NN, SYF, SHSM, MMZ, SS, and FSH participated in the design of the study and wrote the manuscript and contributed essential materials and helped to draft the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: The use of computer-assisted diagnostic tools has increased dramatically in various fields of medicine, especially cancer. It is essential and inevitable to use these tools, especially when there is a need to process large volumes of data, but new diagnostic methods was based on the use of Nano-sensors that have many advantages and they can be used to diagnose breast cancer, one of the most common neoplastic malignancies in the world. The study aims to investigate the relationship between new diagnostic methods and information technology in cancer diagnosis by categorizing research topics and important known aspects of cancer related illness from 1984 to 2017.

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Methods: The evaluation conducted in March 2018 and used to access the articles on diagnostic and therapeutic methods from the PubMed, Medline, and Cochran library, WHO, Iranmedex and PsycINFO databases.
Results: The findings of this study in two sections of cancer and biological sensors show that biomarkers detect disease, and health information technology is expanding and innovating new methods. This can play an important role in managing chronic diseases such as cancer.
Conclusion: Primal diagnosis, reducing the time to diagnose and improving the quality of care during treatment, is one of the health's information technology (IT) benefits of diagnosing cancer. In general, the results this study indicate that the use of information technology to increase the speed of effective therapeutic stages. Resulting in general health, as well as the relationship of information technology with diagnostic and therapeutic methods in our country can greatly increase the level of health and well-being and development, and create a new way of linking information technology and new diagnostic methods to cancer.

Keywords: Cancer; diagnosis; information technology; diagnostic technology.

1. INTRODUCTION

Breast cancer is the most common neoplastic malignancy in the world, and this malignancy is increasing in the world (Farooq et al., 2005) and the highest prevalence of this malignancy is in developed countries [1].

The use of computer diagnostic tools in various medical areas, especially diagnosis and treatment of cancer, has dramatically expanded. Processing medical images is one of the important issues in this field, which requires to use of accurate and rapid methods for the detection and analysis of lesions and disorders in the image. Conventional diagnostic technologies, including magnetic resonance imaging (MRI), computed tomography (CT), positron imaging publisher (PET), and immunohistochemistry analysis of tissues are fully. [2,3] MRI is an advanced medical imaging technique that provides rich information about the human soft tissue anatomy.

It produces detailed body images in any direction. In particular, MRI is useful in musculoskeletal and oncologic imaging (cancer) because it offers better contrast to computer tomography (CT) between soft tissues of the body (Mohamed & Namboodiri, 2017). The use of these tools is essential and inevitable, especially when there is a need to process large volumes of data, but new diagnostic methods have been based on the use of nano-sensors that have many advantages [4].

Nowadays, it needs to the development of information technology and its relationship with diagnostic methods in cancer detection [5]. Breast cancer is due to physical problems that in most cases causes the mother to this is why it limits the daily life and thus decreases the quality of life of the family. Therefore, the study is currently trying to answer the question of whether the bridge between intradermal cancer test (ICT) and new diagnostic methods of cancer can be a solution or method. Theoretical studies have shown that information technology (IT) can be useful in improving cancer care around the world. The current study aims to investigate the relationship between new diagnostic methods and information technology in cancer diagnosis by categorizing the topics studied and important known aspects of cancer related illness from 1984 to 2017

2. METHODS

The evaluation conducted in March 2018 and used to access the articles on diagnostic and therapeutic methods from the PubMed, Medline, and Cochran library, WHO, Iranmedex and PsycINFO databases. Information technology research has been conducted in two stages.The first step is to examine the issues and issues related to information technology and the second step to the relationship between information technology and diagnostic methods. In order to collect information on cancer and information technology, keywords searched in cancer cells and biosensors, cancer and information technology, cancer, diagnosis and ... from 176 articles. 49 articles In terms of theme coverage, content structure and relationship aspect, this paper were used.

3. RESULTS AND DISCUSSION

It discovered that most domestic disease specialists acknowledged the use of computers

for managing their education, and emphasized the need for progress. [6] In Iran, the rate of breast cancer prevalence is close to global statistics, the most common cancer in Iranian women and the second most lethal cancer after lung cancer in breast cancer. Experts say that one out of every eight Iranian women has a chance of getting the disease and about a quarter of women's cancers in the country related to breast cancer [7]. The relationship between cancer and biological sensors followed by technology the information reliably contributes to the reduction of the risk of infection and the diagnosis.

3.1 Cancer and Biosensor

Currently, most diagnostic tests done in centralized laboratories and hospitals. By using expensive equipment that requires highly trained staff, the use of biosensors has facilitated diagnostic technologies, so that work with it done by patients themselves or by medical staff [8-11].

A biosensor is a device in which a biological detector component attached to or connected to a converter, which ultimately converts the biologic signal into measurable electrical signal. To do this, the biosensor in the simplest case, using a biological molecule (eg, an antibody, an enzyme, a nucleic acid, a lectin or a receptor) to detect a converter's analyzer then converts the diagnostic signal into an electrical signal that can be tangible and usable [12].

The technology in the biosensor is that the oxidation reaction - the reduction by measuring the loss or formation of a substrate or product using a mediator between the biomolecule and the electrode, or as a direct electron transfer, done by modifying biomolecules. Diagnosis of changes in a person's disease status by identifying changes in genomic biomolecules [13], Proteome [14], Glycoma [15], transcription [16] Metabolism [17] or microbium [18] can be investigated.

Biomarkers or biomarkers used to detect disease in sensors. Among these biomarkers are MicroRNAs. Biomolecules are small and non-coding RNAs that abnormally expressed in many tumors and have been identify as predictive bioassays for the early detection of many cancers, including breast cancer (Table 1). Tissue specimens have a variety of biomarkers including saliva, glandular, prostate, cerebrospinal fluid, amniotic fluids, blood and the like (Table 1) [19,4] Recent evidence suggests that there is an important molecular link between TGF-β signaling and microRNAs that expresses new perspectives on the inflammatory environment of tumor cells [20]. Recent studies have shown that TGF-β is significantly higher in women with invasive breast cancer, but miR-195 (a type of microRNAs with tumor suppressor activity) is very low. MicroRNAs In non-invasive cancer, but with the progression of cancer and the mediation of TGF-β, these microRNAs are reduced [21]. Biochemical sensors increase and decrease the amount and changes in the biomolecule structure of these biomarkers [14].

3.2 Cancer and Information Technology

Concomitant breast cancer in 2008 in England showed that 48034 new cases of breast cancer observed, of which 99% occurred in women. Breast cancer is the second and most common cause of cancer deaths in women after lung cancer. The highest rates of breast cancer and death have been observed in developed countries, especially in North and West Europe, as well as Australia and North America. While the lowest rates were found in Asia and part of Africa (Cancer Research UK, accessed February 2011).

Histological examination of invasive breast cancer shows that different types of subtypes of this type of cancer have been studied (Table 2). The expression of certain types of specific genes in different types of breast cancer is different, and it has been observe that biomarkers in some of the different subgroups of breast cancer show up (Adams, 2008).

In almost all cases of breast cancer, expression changes occur in the top three genes in a negative way. These three important genes include (HER2) human epidermal growth factor receptor 2-estrogen receptor, α (ERα), progesterone receptor (PR), which indicates excessive expression. Research has shown that this type of breast cancer, especially in aggressive and expanded type, is less responsive to treatment (Dent et al., 2007).

Wallace's research on the impact of information technology on a better understanding of breast cancer has shown that the use of health information technology has the ability to advance cancer care standards and improve care according to care guidelines with the help of therapeutic training [30].

Studies by the Institute of Therapy have shown that the use of Health Information Technology (HIT) has many potential advantages for becoming a full-scale health care system (Institute of Medicine, 2010), as well as other studies on the same issue. Innovative health information technology has been said to play an important role in managing chronic diseases [31].

Table 1. Shows tissue samples that are diverse in biochemicals

Sample Matrix	Biomarkers	Associated Cancer	Ref.
Saliva	microRNA panel (miR-9, miR-134, miR-191)	Head and neck squamous cell carcinoma (HNSCC)	Salazar et al, 2014 [22]
	Micro RNA panel from whole saliva miR-10b, miR-144, and miR-451, saliva supernatant miR-10b, miR-144, miR-21, and miR-451	Esophageal	Xie et al., 2013 [23]
Urine	Bence Jones proteins	Light-chain multiple myeloma	Bradwell et al., 2003 [24]
	Exosome size	Bladder	Liang et al., 2017 [25]
Serum from blood	PSA	Prostate	
	Autoantibodies	CRC, lung, stomach, breast	Chapman et al. 2008. Liu et al. [26,27]
	ZNF	CRC	O'Reilly et al. 2015 [28]
	Igs	CIN and cervical cancer	
Breast milk	TGF-B	Breast cancer	Arcaro et al. 2012 [29]

Table 2. shows the types of histological subtypes in invasive breast cancer, with percentages and survival rates over 10 years (Weigelt et al. 2005)

Histopathological type of invasive breast cancer	Frequency	10-year survival rate
Invasive ductal carcinoma of no special type	50-80%	35-50%
Invasive lobular carcinoma	5-15%	35-50%
Mixed type, lobular and ductal features	4-5%	35-50%
Tubular/invasive cribiform carcinoma	1-6%	90-100%
Mucinous carcinoma	<5%	80-100%
Medullary carcinoma	1-7%	50-90%
Invasive papillary carcinoma	<1-2%	60%
Invasive micropapillary carcinoma	<3%	Unknown
Metaplastic carcinoma	<5%	Unknown
Adenoid cystic carcinoma	0.1%	Unknown
Invasive aprocrine carcinoma	0.3-4%	Unknown
Neuroendocrine carcinoma	2-5%	Unknown
Secretory carcinoma	0.01-0.15%	Unknown
Lipid-rich carcinoma	<1-6%	Unknown
Acinic-cell carcinoma	7 cases	Unknown
Glycogen-rich, clear-cell carcinoma	1-3%	Unknown
Sebaceous carcinoma	4 cases	Unknown

A systematic review conducted by Koskan et al. largely looks at the importance of using social media in knowledge about cancer and its role in identifying and preventing it in society. Koskan et al, 2014 [5] and another A review by Jimbo and his colleagues focusing on cancer and information technology focusing on cancer diagnosis suggests progress in cancer screening as a useful outcome [32].

3.4 Relationship of Information Technology and Cancer

Eadie et al. reviewed the effectiveness of computer-assisted diagnosis of cancer. Their studies showed that computer and technology use had a beneficial effect on breast cancer detection [33]. However, the issue is to find out the relationship between cancer and biomarkers and to bring this information to physicians. Our review of biomarkers in cancer and sensors states that there are many biomarkers Identified and degraded by biomedical sensors that are themselves IT-based. For example, the use of biological sensors such as blood glucose monitoring devices that are commonly used in diabetic patients to measure blood glucose is commonly used by many diabetics, but the physician's knowledge of the patient's blood glucose with the help of IT tools and it is very helpful, or it is intended to be used for biomarkers in breast cancer such as the HER2 biomass sensor that measures the expression of this gene and reports the increase in expression. The report, if administered on a regular basis, for example, every six months by the family physician, will identify the disease well before cancer malignancy and aggression, and this will be a great solution in the IT sector.

4. CONCLUSION

The use of modern technology has long been the focus of many advanced countries. Studies on information technology in the 1980s showed that the physical use of the family from the computer for activities and therapeutic exercises increased from 33% to 45% throughout the year [34,35]. Does it need for the development of information technology and diagnostic methods in Iran?. It is confident that the answer is yes, and there is a huge need for new technologies to quickly and easily identify and reduce costs. The point to be taken into consideration is to give a true and logical solution and, more importantly, to act on it. According to ISNA, in 1396, Iran ranked 89th out of 206 countries in the development of information technology and had two-stage growth in Iran's Internet access to households, which shows that there is a further increase in the country for Iran. Isna, 2017 [36].

Many of these deaths can be mitigate by efforts and strategies that target cancer prevention. Early diagnosis, [37-39] Reducing the time to diagnose and improve the quality of care during treatment [37,40,41].

Taken together, our data suggest that use of information technology to increase the speed of effective therapeutic stages. Resulting in general health, as well as the relationship of information technology with diagnostic and therapeutic methods in our country can greatly increase the level of health, well-being, and development, and by creating a link between information technology and new diagnostic methods of cancer.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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