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A Review in Genomic and Precision Medicine on Cancer in Indonesia

Sry Suryani Widjaja[*1], Rusdiana[2], Ashri Yudhistira[3]
[1,2][Biochemistry Department, Faculty of Medicine, Universitas Sumatera Utara], sry.suryani@usu.ac.id
3[ENT Department, Faculty of Medicine, Universitas Sumatera Utara]
[*]Corresponding Author: sry.suryani@usu.ac.id

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ABSTRACT

Genomic and precision medicine has been a new target on oncology field, as with the genomic study, we can develop the precised medicine. This studies was made to find the development of research on genomic and precision medicine on cancer in Indonesia. This study is conducted systematically to explore an update on genomic and precision medicine on cancer in Indonesia based on the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) to extend this scoping review. After further research and exploration, we found 7 literatures that shares the same inclusion criteria. From these seven literatures, we found that there is a significant development in this field of research, however most studies are about the detection of gene and has not develop research in treament or rehabilitation. Indonesia is a capable country to develop this field of research. With that being said, the encouragement and empowerment of researchs in Indonesia on genomic and precision medicine must be enchanced.
Keyword: Genomic medicine, Precision medicine, Cancer, Indonesia.

ABSTRAK

Pengobatan genomik dan presisi telah menjadi target baru di bidang onkologi, karena dengan studi genom, kita dapat mengembangkan pengobatan presisi. Penelitian ini dilakukan untuk mengetahui perkembangan penelitian pengobatan genomik dan presisi pada penyakit kanker di Indonesia. Kajian ini dilakukan secara sistematis untuk mengeksplorasi pembaruan pengobatan genomik dan presisi pada kanker di Indonesia berdasarkan Preferred Reporting Items for Systematic Review and Meta-analyses (PRISMA) untuk memperluas tinjauan pelingkupan ini. Setelah penelitian dan eksplorasi lebih lanjut, kami menemukan 7 literatur yang memiliki kriteria inklusi yang sama. Dari ketujuh literatur tersebut, kami menemukan adanya perkembangan yang signifikan dalam bidang penelitian ini, namun sebagian besar penelitian masih mengenai deteksi gen dan belum mengembangkan penelitian di bidang pengobatan atau rehabilitasi. Indonesia merupakan negara yang mampu mengembangkan bidang penelitian ini. Oleh karena itu, dorongan dan pemberdayaan penelitian di Indonesia mengenai pengobatan genomik dan presisi harus ditingkatkan.
Keyword: Pengobatan genomik, Pengobatan presisi, Kanker, Indonesia.

1. Introduction

Through time, new knowledge was founded and grew extremely fast. One of this knowledge is the development of new apparatus of technology which very useful for human. The development of technology enhances a new type of innovation that can have a great impact to the medical world, especially in the cancer. Genomic and precision medicine is one of the growing technology and there are a lot of experiments and new accomplishments. Genomic and biomarker is a core innovation of this new era of precision medicine which is a signaling by a protein that can detect certain cancer. Other than that, immunotherapy for cancer and adoptive cell therapy also has developed significantly and can help with curing as preventive, curative, rehabilitative and palliative for patients with cancer [1,2].

The Western countries, such as USA, France, Spain, and Canada, have a lot of contribution with this evolution of biotechnology, Some of the Eastern country also following this biotechnology evolution, such as South Korea [1]. However, due to the need of new technologies, research in growing country is very seldom. Therefore, this field of research needs to be improved in growing countries, such as Indonesia. It is a pity because cases of cancer in Indonesia aren't rare; as recorded, there is 136.2 for every 100,000 population that have cancer in Indonesia. Based on Globocan, there are 18.1 new cases followed by 9.6 deaths. With that being said we want to know the development of genomic and precision medicine in Indonesia. This study wants to show an update on genomic and precision medicine in Indonesia.

2. Material and Methods

This study is conducted systematically to explore an update on genomic and precision medicine on cancer in Indonesia based on the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) to extend this scoping review. The research question can be seen on table 1.

Table 1. Research question used as the eligibility criteria

Aspect	Inclusion criteria	Exclusion criteria
Patient	Genomic and Precision Medicine	-
Outcome	Indonesia	-
Study design	Randomized, double-blind, controlled interventional studies; retrospective or prospective observational studies.	Full text not available; not written in Indonesian/English.

2.1 Eligibility Criteria

Studies included in this systematic review are interventional and also observational studies with the eligibility criteria shown in Table 1. Opinion papers, editorials, conference abstracts, case reports, literature reviews, systematic reviews, meta-analyses, and unpublished paper are excluded. The assessment of eligibility was done individually by each author from screening to quality assessment.

2.2 Search Strategy

We search various databases, such as Pubmed, Scopus, and Google Scholar. We enhance our search strategy by using MesH headings for genomic and precision medicine also cancer, as recommended by the Cochrane Handbook 2008 [3] . Then, we linked each keyword using the Boolean operator with AND and OR where the structural keyword can be seen in Table 2 for every database. We also traced the references of each study found to broaden the scope of the literature search.

Table 2. Keywords used for literatur searching

Search engine	Keywords
Pubmed	(((Genomic [MeSH]) OR (Precision [MeSH])) AND Medicine) AND (Cancer [MeSH]) AND Indonesia
Scopus	TITLE-ABS-KEY("Genomic OR Precision") AND TITLE-ABS-KEY("Medicine") AND TITLE-ABS-KEY("Cancer") TITLE-ABS-KEY("Indonesia")
Hand Searching	((Genomic OR Precision) AND Medicine) AND "Cancer"

2.3 Study Selection

The suitability of studies from each database was assessed manually and narratively. We also select studies that were done in Indonesia or has an affiliation with Indonesian researcher. All authors also performed eligibility assessment individually based on the full text and any other discrepancies was resolved by discussion. However, all relevant articles were viewed for duplication using Google Sheets.

2.4 Data Extraction

All authors extract the data manually and independently. The extraction of data is also done narratively to scope and understand the update on current knowledge in certain fields. Other than that, we also have important data, such as the method of the studies and also the result of the studies.

3. Result

After searching from PubMed and Scopus there are 56 hits. We sought for duplicates and we found no copies for the title. Then we do screening and manually see all studies that were done in Indonesia or have an affiliation with Indonesian researchers. Other than that, we also hand searching in Google Scholar. We finally found 7 literatures that match our inclusion and exclusion criteria. Three pieces of literature have been published in the last 10 years. The PRISMA table can be seen in figure 1. The summary of the result that has been recovered also can be seen in Table 3.

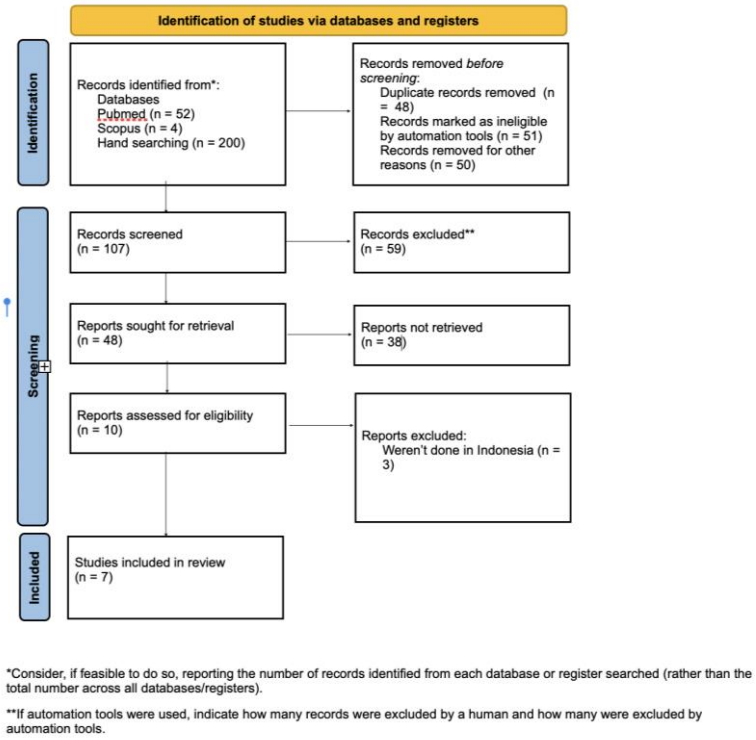

Figure 1. Prisma flowchart

Table 3. Summary of studies obtained

Author (Year)	Objective	Outcome
Clinical		
Abdullah *et* [4]	To describe genomic profile of colorectal cancer patients in Indonesia	Tissues cancer that were collected was tested using AmpliSeq for Illumina Cancer HotSpot Panel v2 Next-generation sequencing and genome analysis kit
Marbun *et al* [5]	To describe the location and nature of mutation in colorectal cancer patients in Indonesia	Analysis of DNA was performed by next-generation sequencing and aligned against GRCh38 The pathogenic outcome was also scored by ACMG classification and FATHMM score.

Author (Year)	Objective	Outcome
Hermansyah *et al* [6]	To assess the PD-L1‘s expression among triple-negative breast cancer populations in Indonesia	PD-L1’s expression using immunohistochemical protein (Daco 22C3 antibodies)
Panigoro *et al* [7]	To find the genome sequencing in breast cancer patients at Cipto Mangunkusumo National Hospital, Jakarta, Indonesia	DNA sequences was assessed using Illumina NextSeq 500 platform
Haryono *et al* [8]	Genome wide association studies in non-Europian women, especially Indonesian women	The outcome assessed with single nucleotide polymorphism (SNP) array 5.0 platform from Affymetrix®
Laboratory		
Mahesworo *et al* [9]	To assessed association networks of single-nucleotide polymorphisms (SNPs) that can differentiate case and control groups in cancer patients.	Using logistic regression network SNP of genome wide association in colorectal patients and using computer to analyze this network of SNP.
Widowati *et al* [10]	To inhibitory proliferation effect of WJMSCs-norCM and WJMSCs-hypoCM on human cancer cells (HeLa, HepG2, pc3, skov3, and hsc3 cancer cell lines)	Using the surface marker of WJMSCs-norCM and WJMSCs-hypoCM from P4-P8

4. Discussion

Genomic and precision medicine for cancer in Indonesia hasn’t improved significantly until now. Some of the studies that have been published mostly are detecting the specific protein or mutation for cancer. However, there isn’t study that assessed certain medicine or treatment to help with cancer in Indonesia. These studies can be seen in Table 4 which shows the summary of the studies that have been collected and analyzed.

From the studies we have assessed, we conclude that Indonesia is still in the phase of detection of certain gene that has connection with cancer. This is one of the development of studies in Indonesia, however as we can also see that Indonesia as a developing country hasn’t has enough technology and resource to conduct clinical treatment research. Other than that, treatment on cancer patient in Indonesia also delayed because must be refer to a better hospital. This is because the medical focused in Indonesia hasn’t completely into cancer purely, but more to infectious disease. This make health cost and human resources were drained in combating infectious diseases [11.12]. Indonesia like other country also facing recovery from COVID-19, this is also might be a reason of undeveloped research in Indonesia in genomic and precision medicine [13,14].

Even though there is the development of genomic and precision medicine for cancer in Indonesia, it is still undeveloped if we compared it with other countries. Other Western country has developed clinical trial research that directly uses patient as their subject. We can see that the major contributor of this genomic and precision medicine is the United States where the newest studies show a phase one clinical trial for the patient with acute myeloid leukemia [1,15]. Other than that, China as a neighboring Asian country of Indonesia has also developed clinical trials where the newest studies discuss the treatment of various types of cancer [16,17]. We can see the enhancement of new knowledge but Indonesia hasn't This is a pity because there are different types of genomes in the Indonesian population and it can be beneficial to study so that we can see the effectiveness of certain medicine or treatment in the Indonesian population.

Indonesia provides a fertile ground for exploring and researching the field of genomic and precision medicine, particularly in relation to cancer. With its large population and diverse genetic makeup, studying the genomic variations and mutations associated with different types of cancer can contribute to personalized treatment strategies. Researchers can investigate the impact of genetic factors on cancer susceptibility, progression, and response to therapy within the Indonesian population. Indonesia's rich of biodiversity offers opportunities to explore natural compounds and traditional medicine practices that may hold potential in cancer treatment. By conducting comprehensive studies and leveraging advancements in genomic technologies, researchers can pave the way for targeted therapies, early detection methods, and improved outcomes in cancer care within the Indonesian population.

Indonesian researchers are capable of developing research on genomic and precision medicine, although Indonesian technologies aren't as advanced as other industrial developed country. This is very important and crucial because Indonesia has a different ethnic population and epidemiology studies for gene expression is a crucial knowledge that can increase the development of medicine in Indonesia. Other than that, we would like to suggest and encourage Indonesian researchers to develop a clinical trial to assess newly made precision medicine that can support patients with cancer in Indonesia, even made its own precision medicine so that Indonesia can also contribute to this magnificent development of genomic and precision medicine.

Author Contribution Statement

All authors have reviewed and approved the final version of the manuscript for submission. The contributions of each author were integral to the completion of this systematic review.

Conflict of Interest

All authors declared no conflicts of interest.

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