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FOREWORD

Dengan mengucapkan syukur kepada Tuhan Yang Maha Kuasa, akhirnya Supplementary Edition Volume 7 Issue 2SP spesial 3rd Amerta Nutrition Conference 2023 dapat diterbitkan. Amerta Nutrition Conference merupakan kegiatan rutin tahunan yang diselenggarakan oleh Jurnal Amerta Nutrition, Departemen Gizi Kesehatan, Fakultas Kesehatan Masyarakat, Universitas Airlangga. Pada tahun 2023, penyelenggaraan Amerta Nutrition Conference merupakan yang ke-3 kalinya, setelah pertama kali dilaksanakan pada tahun 2019. Tema besar yang diangkat dalam konferensi ini adalah “Strategi Pencegahan dan Penanganan Obesitas menuju Indonesia Maju”. Terdapat dua kegiatan utama dalam kegiatan ini, yakni Call for Paper dan Webinar Internasional. Adapun tujuan dari kegiatan ini adalah untuk menjaring karya-karya terbaik dari mahasiswa dan civitas akademika berupa artikel terkini dan update dalam bidang gizi kesehatan, sesuai dengan tema yang telah ditentukan dimana karya selanjutnya akan diterbitkan di Jurnal Amerta Nutrition. Selain itu, 3rd Amerta Nutrition Conference 2023 dilaksanakan guna memperkenalkan Jurnal Amerta Nutrition kepada mahasiswa dan civitas akademika gizi dan kesehatan masyarakat secara lebih luas di dalam maupun luar negeri.

Supplementary Edition Volume 7 Issue 2SP spesial 3rd Amerta Nutrition Conference 2023 memuat seluruh artikel dari peserta terpilih yang mengikuti 3rd Amerta Nutrition Conference 2023 khususnya bertema obesitas dan non-obesitas. Diharapkan karya ini menjadi daya ungkit pengembangan budaya menulis dan pengkajian ilmiah yang komunikatif serta sebagai daya pikat para pembaca dan penulis untuk berpartisipasi pada Amerta Nutrition Conference mendatang. Semoga pemikiran-pemikiran dan karya-karya yang ditampilkan Jurnal Amerta Nutrition dapat memberikan manfaat dan memperkaya khasanah pengetahuan bagi pembaca.

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RESEARCH STUDY

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The Role of Nutritionist in Gene-Based Nutrition Services in Indonesia

Peran Ahli Gizi Dalam Memberikan Pelayanan Gizi Berbasis Gen di Indonesia

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ABSTRACT

Background: The rapid development of genetics science provides significant impacts on disease prevention and control. In Indonesia, the application of dietetics is not popular. Thus, the role of nutritionists in the application of nutritional genomics in dietetic work practices is highly needed. The role of nutritionists is important in providing information about how nutrition and genetics interact in influencing health and providing alternative early nutritional interventions.

Objectives: Identify the role of nutritionists in providing gene-based nutrition services in Indonesia.

Methods: This qualitative study used a phenomenological approach. This study was carried out in five provinces in Indonesia. Informant data were obtained from quantitative research. The determination of the informant used a purposive sampling technique involving six informants. Data were collected by conducting structured interviews online using Zoom Meeting. Data were analyzed using thematic analysis with NVIVO v.12 software.

Results: Most nutritionists who have and have not implemented gene-based nutrition services know about gene-based nutrition services. However, some do not know the meaning of nutrigenetics and nutrigenomics. Besides, they know the role of nutritionists, namely as a counselor to provide counseling, provide advice regarding diet according to the patient's needs, and provide motivation to patients to follow a diet according to the patient's needs.

Conclusions: In providing gene-based nutritional services, nutritionists play a role as counselors to provide counseling, provide advice regarding patient needs, and provide motivation to patients to adopt a diet according to patient needs.

INTRODUCTION

Non-communicable diseases (NCDs) become one of the main health problems in Indonesia¹. NCDs can be caused by changes in the environment, lifestyle, and eating behavior. Basic Health Research reported that the majority of NCD prevalence in Indonesia in 2018 covered cancer (1.8%), stroke (10.9%), chronic kidney disease (3.8%), diabetes mellitus (2%), heart disease (1.5%), hypertension (34.1%), and obesity (21.8%). Cardiometabolic diseases such as cardiovascular disease (CVD), obesity, hypertension, and type 2 diabetes are the leading causes of death, morbidity, and high health-care costs worldwide³⁻⁴. Obesity is a type of NCD influenced by genetic factors³. Obesity occurs due to unbalanced lifestyle factors⁵. Genes are sequences of Deoxyribonucleic Acid (DNA) that carry certain information codes such as codes for forming proteins and hormones. Each gene varies in size from hundreds of DNA bases to more than two million bases. Genes can

influence the risk of chronic disease. Each person has different genes where genes can influence the body's response to nutrient intake⁶⁻⁸.

The ability of genes to carry NCDs to descendants encourages the establishment of gene-based nutrition services. Gene-based nutrition services have two approaches, namely, nutrigenomics and nutrigenetics. They are currently being developed worldwide, including in Indonesia. Nutrigenomics and nutrigenetics are two aspects of the field of nutrition. Although they have different approaches, the goals are the same, namely to maximize health through personalized diets that can be utilized by various age groups, pregnant women, and people suffering from certain diseases. The approach covers nutrigenetics and nutrigenomics which focuses more on nutrition influencing genetics affecting food intake or nutritional needs⁹⁻¹⁰. Gene-based services in dietetic practices have not been implemented optimally due to the fear of the large quantity of data available in a

disease case^{6,7}. Thus, nutritionists in the field of genetic services are still unprepared to provide nutritional counseling. The implementation of nutrigenetics and nutrigenomics approaches are expected to be used as a reference to achieve the goals of implementing nutritional interventions by optimizing the health of each individual^{6,11}.

Gene-based services have been available in some countries, such as Canada, the United States, Australia, and Indonesia. However, the main challenges in the provision of this services are preparing a gene-based service delivery model and limited nutrition experts in providing gene-based nutrition services⁷. Some companies abroad have run genetic-based nutritional counseling services, namely Nutrigenomix. This Canadian company was initiated by the University of Toronto. It was established in 2012 in Canada, the United States, and Australia. The Nutrigenomix test kits can be used for nutritional counseling related to genetics performed by nutritionists and Registered Dietitian (RD)⁵. Studies on nutrition and genetic have been conducted in Indonesia focusing on GeNulne (gene-nutritional interactions) which aims to examine interactions between genetic factors and food (nutrigenetics)³.

Nutritionists need to understand nutritional genomics because it can provide information on how nutrition interacts with genotype on phenotype. Nutrigenomics can provide an understanding of the optimal diet from more secure alternative nutritional interventions⁶. The application of nutritional genomics science has been supported by technology that enables more accurate disease prediction and diet recommendations in accordance with genetic variations for earlier disease prevention¹².

A study conducted in the United Kingdom (UK) revealed the low involvement of nutritionists' roles. The rapid development of genetics and nutritional genomics science plays a significant role in disease prevention and control. Thus, health professionals, including nutritionists need to play a role and apply nutritional genomics into their work practices¹³. This present study aims to identify the role of nutritionists in providing gene-based nutrition services in Indonesia.

METHODS

This qualitative study used a phenomenological approach¹⁴. Data were collected from structured interviews conducted online using Zoom Meeting. This study involved five major provinces in Indonesia, namely DKI Jakarta, West Java, Central Java, East Java, and DI Yogyakarta that have provided gene-based nutrition services in collaboration with PT. Kalbe Farma and PT. Prodia Widyahusada. This study was conducted in February– July 2023. The determination of the informant used a purposive sampling technique based on

predetermined inclusion and exclusion criteria¹⁵. The inclusion criteria were (1) nutritionists working in a hospital, (2) having a minimum education level of D3 majoring in Nutrition, (3) living in the research location, (4) have and have not provided gene-based nutrition services. Meanwhile, the exclusion criteria were not willing to participate in this study and not willing to complete the interview. The sample size was six people and had reached data saturation¹⁶.

The selection of informants was based on data from respondents who had filled out an online survey using Qualtrics Survey software. Then, the researcher selected the informants according to predetermined criteria. The researchers contacted the selected informants using WhatsApp messages. Informants received an explanation about the study and then signed informed consent to participate in this study. This study has received ethical approval from the Ethics Commission of Alma Ata University Yogyakarta (No: KE/AA/VI/1011148/EC/2023).

Informants are participants of the study who provide information needed in the study¹⁷. The informants were nutritionists who have or have not provided gene-based nutrition services working in hospitals or clinics. This study aims to determine the role of nutritionists in providing gene-based nutrition services. Roles are a dynamic aspect with a dynamic position where individuals carry out their rights and obligations in accordance with their position¹⁸. Nutritionists play a vital role in the improvement of nutritional status and health of the community¹⁹. Nutrition services are an effort to improve and increase the nutrition, food, and dietetics of communities, groups, individuals, or clients. This service includes activities such as collection, processing, analysis, conclusions, recommendations, implementation, and evaluation of nutrition, food, and dietetics in order to achieve optimal health status in healthy or sick conditions²⁰. Gene-based nutrition services consist of three components, namely genetic tests, genetic literacy, and nutrition counseling skills²¹.

This study used a thematic analysis²². Data obtained from various sources were reduced using the Nvivo 12 software. Then, they were presented with a short description or narrative text and concluded or verified to ensure credibility (degree of confidence). This study also used triangulation examination techniques, namely source triangulation by interviewing nutrition specialist as key informants²³.

RESULTS AND DISCUSSION

Informant Characteristics Data

This study involved six nutrition experts working in hospitals which are located in DKI Jakarta, West Java, Central Java, East Java, and DI Yogyakarta Provinces.

Table 1. Characteristics of informants

Informant	Gender	Age	Latest education level	Workplace	Province	Gene-based service status
IF 1	Female	29 years	S2	Type A Hospital	Jakarta	Yes
IF 2	Female	29 years	D4	Puskesmas	Jakarta	No
IF 3	Female	39 years	S1	Type B Hospital	East Java	No
IF 4	Male	26 years	S1	Primary Clinics	East Java	No

Informant	Gender	Age	Latest education level	Workplace	Province	Gene-based service status
IF 5	Female	41 years	D4	Puskesmas	Central Java	No
IF 6	Female	26 years	S1	Nalagenetik	Jakarta	Yes

This study involved six informants consisting of five women and one man with an average age range of over twenty-five and above. Their education levels range from D4, S1 to S2 with different types of institutions. Two

informants have provided gene-based nutrition services but four of them have not provided gene-based nutrition services.

Table 2. Characteristics of key informants

Informant Code	Gender	Age	Province	Education	Institution Type
Key Informant	Female	41 Years	East Java	Clinical Nutrition Specialist Doctor	Gene-based nutrition service provider

The characteristics of the key informants are a clinical nutrition specialist doctor (SPGK) who provides gene-based nutrition services. Her education level is a clinical nutrition specialist doctor. She works at a gene-based nutrition service provider called Nalagenetics so she can provide relevant information.

related to health. The dietary components of nutrigenetics are essential nutrients, bioactive, and metabolites from a diet. Nutrigenetics aims to find out how an individual's genetic makeup coordinates with the response to a diet. Examples of nutrigenetics conditions: for defective aldehyde dehydrogenase enzyme, avoid alcohol, galactosemia, and milk and its derivative, while for lactose intolerance, avoid milk and derivatives⁶.

Theme 1: Gene-Based Nutrition Services

Definition of Nutrigenetics and Nutrigenomics

Based on the results of interviews with informants regarding the definition of nutrigenetics and nutrigenomics, the majority of the informants who have and have not carried out gene-based nutrition services can explain the scientific meaning of nutrigenetics and nutrigenomics. However, two out of six informants cannot explain them. An informant said:

"Nutrigenomics is the impact of nutritional intake on gene expression, if I'm not mistaken, I'm sorry, I forgot." (IF 3, female, 39 years old, S1)

"Nutrigenomics focuses on the response in our body or the response in our genetics that might appear when exposed to food ingredients." (IF 6, female, 26 years old, S1)

"So, to be honest, I've never heard of the service before, I don't know anything about that service." (IF 2, female, 29 years old, D4)

"I do not understand about them (Nutrigenetics, Nutrigenomics)." (IF 5, female, 41 years old, D4)

Nutrigenomics is food or food ingredients affecting gene expression²⁶. In general, nutrigenomics is a science that studies the influence of nutrients on health. This influence is reviewed through changes at the gene level, transcriptome (mRNA), proteome (protein), metabolome (metabolites), and changes at the physiological level.

Some informants stated that they did not know about Nutrigenetics and Nutrigenomics because they had not implemented gene-based nutrition services and the services were still new. Other studies reveal that the low involvement of nutritionists will influence their knowledge²⁴.

Nutrigenomics is the science that studies the interactions between dietary components and the genome which can cause changes in proteins and other metabolites influencing gene expression. Nutrigenomics is a tool to explain biological systems that occur after nutritional stimulations⁶. Some essential nutritional components can influence changes in gene activity and health, for example, carbohydrates, amino acids, fatty acids, calcium, zinc, selenium, folate, and vitamins A, C, and E, and non-essential bioactive components that significantly influence an individual's health²⁶.

Meanwhile, four out of six informants can define nutrigenetics and nutrigenomics well. Some identified nutrigenetics as the science that studies how genes influence nutrition, while nutrigenomics is the science that studies how nutrients influence gene expression in the body. The informant said:

Benefits of Gene-Based Nutrition Services

The majority of the informants (4 out of 6 informants) believe that the gene-based nutrition service is beneficial. By implementing this service, the faster the intervention, the better and more precise the examination, and the faster the recovery. This is in line with the statements of some informants:

"Nutrigenetics is more about our bodies, the condition of our bodies when related to metabolizing one nutrient?" (IF 6, female, 26 years old, S1)

"So, we will know earlier what kind of disease that will appear since we were a kid. The sooner the

Nutrigenetics is a science that studies the influence of genetic variation on dietary responses and the role of nutrients and bioactive contained in food on gene expression²⁵. Generally, nutrigenetics is the science that studies the influence of genetic variations in individuals on interactions between diet components

intervention, the better the intervention and possibility of recovery" (IF 2, female, 29 years old, S1)

"We can know better whether someone is at risk of a health condition" (IF 6, female, 26 years old, S1)

Other studies reveal that the concept of personalized nutrition means that each individual has their own unique genes to adapt to nutritional intake, environment, and risk of disease. Each individual's genetic factors are related to physical activity, health status, and eating behaviors. Personalized nutrition has the benefit of predicting the prevention of NCDs or malnutrition through a genetic approach. It can also be used to provide a sustainable diet plan. Personalized nutrition can be applied to vulnerable individuals such as pregnant women, elderly people, or healthy individuals who want to prevent disease and improve their health status²¹.

Advantages and Disadvantages of Gene-Based Nutrition Services

Based on the results of the interview, three out of six informants believe that the test has some such as preventing disease early and knowing more about a person's basic nutritional characteristics. The informant's statement can be seen below.

"I've already explained the advantages. It is useful for faster intervention and more accurate diagnosis." (IF 2, female, 29 years old, D4)

"We can know each person's nutritional characteristics" (IF 6, female, 26 years old, S1)

Most of the informants (5 out of 6) agree that this service has some disadvantages such as being expensive, requiring a long time, and having a low number of patients. It is in line with the following statements:

"Patients complain about the costs." (IF 1, female, 29 years, S2)

"Maybe that's the advantage, it's expensive and takes quite a long time." (IF 2, female, 29 years old, D4)

Recently, gene testing is still quite expensive because gene-based nutritional services are still limited in Indonesia. However, gene testing will likely be cheaper and easier to do in the future along with the rapid development of nutrigenetics and nutrigenomics studies²⁷.

Management of Gene-Based Nutrition Services

Based on the results of the interviews, the majority of informants (2 out of 6) agree that the management of gene-based nutrition services is carried out by looking at the report first and providing advice to the patient (counseling). Then, it is continued by carrying out the treatment in teams. It is in line with the following statement:

"The management is by looking at the report first." (IF 6, female, 26 years old, S1)

A study conducted in 2020 reveals that one of the examination methods used saliva, so it is comfortable,

non-invasive, and fast. Patients are given a special kit to collect saliva by spitting according to a predetermined line. After spitting, the kit should be closed and the preserving liquid should flow. Patients who undergo this gene-based nutritional service examination need to do fasting for a minimum of 30 minutes – 60 minutes before taking the test. They are only allowed to drink water. Then, if they use lip color, it needs to be cleaned first. Then the provider will send samples abroad, namely to a laboratory in Canada for analysis using microarray techniques. The results of the genetic test will come out approximately 3-4 weeks after sending the sample. The results are in book form. Then, the examination results will be read by a Clinical Nutrition Specialist to analyze the examination results and then provide advice regarding appropriate diet and exercises according to the patient's²⁸.

The Importance of Gene-Based Nutrition Service in The Future

Based on the results of interviews, all informants agree that gene-based nutrition services are important for prevention. Besides, they state that it is time to provide gene-based nutrition services for faster and better interventions. It is in line with the following statements:

"I think the time is very important to provide gene-based nutrition services." (IF 3, female, 39 years old, S1)

"It has an important role, especially for prevention, it has a lot of potential" (IF 6, female, 26 years old, S1)

Nutrigenetics and nutrigenomics development will produce approaches to prevention and genetic nutritional therapy for individuals or groups of people. Management for prevention and therapy caused by certain genetic variations needs the role of nutrition and diet. Developments in gene-based nutrition services will bring a revolution in food supply and processing, food and diet product formulation, and prevention and therapy of nutritional problems, as well as for health in the future²⁹.

Health Workers Involved

Based on the results of the interviews, all informants agree that the health workers involved in this gene-based nutrition service are nutrition specialists, nutritionists, and laboratory personnel. It is in line with the following statements:

"Together with the doctor so far, the nutritionist is just like a compliment. For example, there's a case study, we're invited." (IF 1, female, 29 years old, S2)

"In terms of providing services, as this nutrigenetic study is quite in-depth, it is recommended in nutritional specialists and nutritionists." (IF 6, female, 26 years old, S1)

One group of health workers involved in the application of nutrigenetics and nutritional

nutrigenomics are dietitians/nutrition workers who have expertise in biomedical and nutritional sciences and have a good ability to translate and convey health messages to the public. Other studies show the role of nutritionists in gene-based nutrition services in clinical activities related to genetics and nutritional genomics, such as discussing the genetic and dietary basis for patient illnesses and providing advice on food intake to patients³⁰. Thus, nutritionists not only play a role as a complement but also discuss the genetic and dietary basis for the patient's illness and provide advice regarding the patient's diet according to the patient's needs.

Theme 2. The Role of Nutritionists in Gene-Based Nutrition Services

Based on the results of the interview, the majority of informants (5 out of 6) agree that nutrition workers play a role in gene-based nutrition services such as providing advice, counseling, or education to patients. It is in line with the following statements:

"For example, in consultation, we still do things normally." (IF 1, female, 29 years old, S2)

"The role is more like giving advice or providing counseling such as what food ingredients need to be increased or reduced, and possible risks." (IF 6, female, 26 years old, S1)

"From my personal experience, I usually give direction to the patient, determine the patients' diet according to their genetics, and what needs to be avoided and what needs to be considered to avoid disease." (KI, female, 41 years old, Nutrition Specialist)

Other studies reveal that the role of nutrition workers in providing education, motivation, and counseling to patients and families is important because it is one way to speed up the process of patient recovery. Besides, it can help patients to prevent diseases³⁰.

The Importance of Genetic Science in The Nutrition Service Practices

Based on the results of the interviews, all informants agree that mastering genetic science is important to develop knowledge and increase insight. Besides, they are willing to participate in seminars on nutrigenetics. It is in line with the following statements:

"This nutrition service is important. As nutritionists, we have to be aware that the world is changing. Like it or not, we have to understand it and we have to master it." (IF 1, female, 29 years old, S2)

"It's important but the market is still limited now. I think, ideally it's important." (IF 6, female, 26 years old, S1)

Today, nutrition workers need to master genetic science in nutritional services because developments in health will continue as stated by the key informant:

"It is a demand of changing times. Medical science will continue to develop, so like it or not, we have to be able to master it, I'm still learning too." (KI female, 41 years old, Nutrition Specialist)

One of the Health professional groups that will be involved in the application of nutritional genomics are nutritionists or nutritional workers who have expertise in biomedical and nutritional sciences. They need to translate and convey health messages to the public. The rapid development of genetics and genomics sciences greatly affects disease prevention and control. Thus, health workers, including nutrition workers, need to organize genomics and nutritional genetics in their practice³⁰.

Challenges in Providing Gene-Based Nutrition Services

Based on the results of interviews, the majority of informants (5 out of 6) agree that the challenges in providing gene-based nutrition services are related to costs and facilities.

"The problem is patients' complaint about is the cost, and it seems like they are looking for other alternatives which are cheaper but have good results." (IF 1, female, 29 years old, S2)

"The facilities are still limited and the DNA testing may need to be more specific, so it may still be limited in my city." (IF 4, male, 26 years old, S1)

"Patients rarely want it because it is pricy. As far as I know, in Indonesia, maybe there are only two providers that can carry out the test, or if I'm not mistaken, it's two or three providers." (KI, female, 41 years old, Nutrition Specialist)

The key informant explains that the most common problem is patients rarely want to get gene-based nutrition testing because the price is quite expensive. The cost is around two million to eleven million rupiah and there are only few providers of in Indonesia. Thus, the data need to be sent abroad and it will take time.

Interest In Implementing Gene-Based Nutrition Service

Based on the results of the interviews, all informants who have not provided gene-based nutrition services are interested in implementing gene-based nutrition services.

"Yes, I'm really interested if the lab can support that. But the problem is, for example, if I have to refer a patient for a lab check somewhere else, it's quite difficult because my workplace is quite far from everywhere." (IF 2, female 2 years, D4)

"Yes, I'm interested. When I have found the right facilities and infrastructure that are easy and affordable, I will implement it." (IF 4, male, 26 years old, S1)

"Yes, of course." (IF 5, female, 41 years old, D4)

All informants who have not provided gene-based nutrition services are interested in implementing

this examination in their work practices. One informant said that she is interested in implementing gene-based nutrition services if the facilities and infrastructure are appropriate (easy, precise, and affordable) and she also needs to prepare herself by studying. Other studies show that factors such as cost and ethics need to be addressed before implementing gene-based nutrition services. Nutritionists who have not provided gene-based nutrition services need to carry out relevant training and learning before implementing gene-based nutrition services as the knowledge about nutritional genomics continues developing. Thus, nutritionists can provide dietary advice based on genetic information¹³.

CONCLUSIONS

In gene-based nutrition services, nutritionists play roles as counselors to provide counseling regarding genetic examination results, advice regarding eating patterns that suit the patient's needs, and motivation to the patient. In general, the majority of nutritionists' knowledge of gene-based nutrition services is quite good but some have not implemented gene-based nutrition services so they cannot define nutrigenetics and nutrigenomics appropriately. Some also cannot explain the handling or management of gene-based nutrition services properly. Thus, providing training related to nutrigenetics and nutrigenomics for nutritionists who have not implemented gene-based nutrition services is important. Besides, it can be followed up by adding materials related to nutrition and genetics in the education curriculum for Nutrition Students in undergraduate and professional programs.

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Conflict of Interest and Funding Disclosure

The author declares that this study has no conflict of interest and this study is solely funded by the author.

REFERENCES

1. Linda, O. & Rahayu, L. S. Prevensi Awal Dan Lanjutan Penyakit Degeneratif Untuk Usia Dewasa Di Masa Pandemi Covid-19. *J. Arsip Pengabd. Masy.* **2**, 107–115 (2021).
2. Ramdhan, D. H. Penelitian Genom Dan Implikasinya Dalam Kesehatan Masyarakat Di Indonesia. *Kesmas Natl. Public Heal. J.* **9**, 1 (2014).
3. Alsulami, S. *Et Al.* Interaction Between The Genetic Risk Score And Dietary Protein Intake On Cardiometabolic Traits In Southeast Asian. (2020).
4. Kemenkes Ri. Hasil Riset Kesehatan Dasar Tahun 2018. *Kementrian Kesehat. RI.* **53**, 1689–1699 (2018).
5. Suiroaka, I. . Penyakit Degeneratif, Mengenal, Mencegah Dan Mengurangi Faktor Resiko 9 Penyakit Degeneratif. (2012).
6. Harry Freitag Luglio Muhammad, Dian Caturini Sulistyoningrum, Rio Jati Kusuma Dengan Anggi Laksmi Dewi, I. K. *Nutrigenomik Dan Nutrigenetik Bagi Mahasiswa Gizi.* (Gadjah Mada University Press Anggota Ikapi Dan Appti, 2021).
7. Muhammad, H. F. L. *Nutrigenetik Rekomendasi Kebutuhan Energi Dan Zat Gizi Makro Berbasis Genetik Untuk Layanan Personalized Nutrition.* (2022).
8. Surendran, S. *Et Al.* A Nutrigenetic Approach For Investigating The Relationship Between Vitamin B12 Status And Metabolic Traits In Indonesian Women. *J. Diabetes Metab. Disord.* **18**, 389–399 (2019).
9. Aji, A. S. *Et Al.* Impact Of Maternal Dietary Carbohydrate Intake And Vitamin D-Related Genetic Risk Score On Birth Length: The Vitamin D Pregnant Mother (Vdpm) Cohort Study. *Bmc Pregnancy Childbirth* **22**, 1–11 (2022).
10. Alathari, B. E. *Et Al.* Interaction Between Vitamin D-Related Genetic Risk Score And Carbohydrate Intake On Body Fat Composition: A Study In Southeast Asian Minangkabau Women. *Nutrients* **13**, 1–13 (2021).
11. Aji, A. S., Yusrawati, Y., Malik, S. G. & Lipoeto, N. I. The Association Between Vitamin D-Related Gene Polymorphisms And Serum 25-Hydroxyvitamin D Concentration: A Prospective Cohort Study In Pregnant Minangkabau Women, Indonesia. *J. Nutr. Sci. Vitaminol. (Tokyo).* **66**, S295–S303 (2020).
12. Aji, A. S. *Personalized Functional Foods Masa Depan Penerapan Personalized Nutrition Advice. Personalized Functional Foods: Masa Depan Penerapan Personalized Nutrition Advice* (2020).
13. Nacis, J. S. *Et Al.* "Right Diet For The Right Person": A Focus Group Study Of Nutritionist-Dietitians' Perspectives On Nutritional Genomics And Gene-Based Nutrition Advice. *J. Community Genet.* **13**, 49–57 (2022).
14. Ulfa, R. Konsep Dasar Penelitian Kualitatif Dalam Penelitian Pendidikan. *Al-Fathonah* **2853**, 39–54 (2022).
15. Muslihah, N., Habibie, I. Y., Rahmawati, W., Nugroho, F. A. & Wilujeng, C. S. *Penelitian Kualitatif Gizi.* (Ub Press, 2022).
16. Mmoleong, L. *Metode Penelitian Kualitatif Edisi Revisi.* (Remaja Rosda Karya, 2014).
17. Nurdiansyah, F. & Rugoyah, H. S. Strategi Branding Bandung Giri Gahana Golf Sebelum Dan Saat Pandemi Covid-19. *J. Purnama Berazam* **2**, 159 (2021).
18. Yare, M. Peran Ganda Perempuan Pedagang Dalam Meningkatkan Kesejahteraan Keluarga Di Kelurahan Karang Mulia Distrik Samofa Kabupaten Biak Numfor The Dual Role Of Women Traders In Improving Family Welfare In Karang Mulia Village, Samofa District, Biak Regency Numfor. *Copi Susu* **3**, 1–12 (2021).
19. Kesehatan, K. *Pelayanan Pekerjaan Dan Praktik Tenaga Gizi. Kementerian Kesehatan Ri* (2013).
20. Kementerian Kesehatan Ri. *Pedoman Pgrs*

- Pelayanan Gizi Rumah Sakit.* (2013).
21. Helmyati. Mengenal Personalized Nutrition: Peran Nutrigenetik Dan Nutrigenomik. (2022).
 22. Sugiyono. *Metode Penelitian Kuantitatif, Kualitatif Dan R & D.* (Alfabeta, 2006).
 23. Sa'adah, M., Rahmayati, G. T. & Prasetyo, Y. C. Strategi Dalam Menjaga Keabsahan Data Pada Penelitian Kualitatif. *J. Al 'Adad J. Tadris Mat.* **1**, 54–64 (2022).
 24. Collins, J. *Et Al.* The Application Of Genetics And Nutritional Genomics In Practice: An International Survey Of Knowledge, Involvement And Confidence Among Dietitians In The Us, Australia And The Uk. *Genes Nutr.* **8**, 523–533 (2013).
 25. Elsamanoudy, A., Mohamed Neamat-Allah, M., Hisham Mohammad, F., Hassanien, M. & Nada, H. The Role Of Nutrition Related Genes And Nutrigenetics In Understanding The Pathogenesis Of Cancer. *J. Microsc. Ultrastruct.* **4**, 115 (2016).
 26. Proboningsih, J. Nutrigenomics Alternative Health Care In The Future. *J. Keperawatan* **VIII**, 50–52 (2015).
 27. Mashudi, S. & Armyati, E. O. *Paradigma Baru Penanganan Skizofrenia Perspektif Nutrigenomik.* (2021).
 28. Fanardy, A. Tinjauan Nutrigenomik. *Cermin Dunia Kedokt.* **47**, 134–138 (2020).
 29. Indonesia, Pakar Gizi. *Ilmu Gizi Teori Dan Aplikasi.* (2016).
 30. Sulistiyanto, A. D., Handayani, O. W. K. & Rustiana, E. R. Peran Petugas Gizi Dalam Memberikan Pelayanan Asuhan Gizi Pada Pasien Rawat Inap. *Unnes J. Public Heal.* **6**, 75 (2017).