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Articles

The State of the Health Care System in Sochi in middle of 1923 year

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Abstract

This article is devoted to the study of the state of the health care sector in Sochi city in 1923. In the article, the authors analyze the state and problems of the city's health care sector, providing various data on social institutions of the city, such as the city hospital and its surgical department, the city orphanage and the city pharmacy. As research materials, this work uses documents from the Sochi city archive. The research methodology is presented by both general scientific and special historical research methods. In conclusion, the authors note that almost all city medical institutions had a number of problems that required immediate elimination, among which are: lack of inventory and equipment, insufficient supply of medical drugs and dressings, poor infrastructure, as well as poor nutrition of patients.

Keywords: medicine, history of medicine, health care, state of health care, health care problems, Sochi District, Sochi, 1920s.

1. Introduction

Medicine of the present time has significantly advanced in its development, allowing to overcome the difficulties of treatment and prevention of diseases of the population, which were previously insurmountable. Based on this, the study of the history of medicine is an important aspect in understanding the evolution of the processes of formation and development of modern medicine. In this article, the authors propose to consider the issue of the functioning of the health care sector of the city of Sochi in 1923.

The purpose of the study is to analyze the state of the health care sector of the city of Sochi in the middle of 1923.

This article is an attempt by the authors to examine in detail the history of medicine and the health care sector of the city of Sochi in the first half of the 20th century.

2. Materials and methods

The research materials in this paper are the documents of the Sochi City Archive, namely: the minutes of the meeting of the Presidium of the Sochi District Executive Committee, held on July 23, 1923, which contains an act of inspection of the state of the health care sector in the city of Sochi (SGA. F. R-25. Op. 1. D. 73. L. 69-73).

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The research methodology is based on general scientific and special historical research methods. General scientific research methods are represented by: analysis, synthesis, induction, deduction and the method of content analysis. Special research methods used in the work: historical-typological, historical-genetic method, as well as the narrative method.

3. Discussion

Currently, there are a number of works in Russian historiography that are devoted to the study of various aspects of the city of Sochi at the beginning of the 20th century. Researchers touch upon such topics as state and legal regulation (Natolochnaya, 2011), the development of automobile transport (Rumyantseva, 2012; Cherkasov, 2011), the activities of the police (Gonta, Taran, 2023), the public education system (Romanova i dr., 2023; Bagdasaryan, 2011) and other aspects (Tveritinov, 2024).

However, the state of the healthcare sector during this period was not subjected to a separate and detailed analysis. Thus, this work will organically complement the existing historiography of the city of Sochi, studying new data on its healthcare system.

4. Results

In the period from July 6 to July 12, 1923, a commission of the Black Sea health department consisting of: representative of the Sochi district executive committee V.A. Shpank, representative of the union of all medical and sanitary labor Dr. Kozlov and chairman of the Sochi health department Dr. Zakharov, in the presence of an authorized person of the Sochi health department Dr. V.P. Kester, conducted an audit survey of the state of affairs and reporting of the health department of the city of Sochi (and organizations subordinate to it) (SGA. F. R-25. Op. 1. D. 73. L. 72).

Health Department of the city of Sochi.

The authorized representative of the Black Sea health department for the Sochi region was Dr. Kester. The department office had 2 employees (a secretary and a clerk). The composition of other health institutions is presented in Table 1.

Table 1. Data on the number of employees and places for patients in urban medical institutions (SGA. F. R-25. Op. 1. D. 73. L. 72)

№	Subordinate institutions	Number of employees
1.	Malaria outpatient clinic at the health department	1 employee
2.	Orphanage for 25 people	10 employees
3.	City hospital for 35 patients	23 employees
4.	Central outpatient clinic at the city hospital	4 employees
5.	Surgical department of the city hospital for 15 patients	13 employees
6.	Adler hospital for 15 patients	9 employees
7.	Yermolov hospital for 5 patients	5 employees
8.	Khostinsky medical center for 5 patients	1 employee
9.	Krasnopolyansky medical center	1 employee
10.	Loo medical center	1 employee
Total: 100 patient beds and 74 staff.		

According to the staffing level approved by the Black Sea Health Department (the estimate was approved by the district Black Sea Health Department for the third quarter of 1923), the entire Sochi district was assigned a staff of 72 employees. The resulting 2 employees in excess of the staffing level – one of whom was supported by local funds (receipts from the outpatient clinic) and two employees received one salary for two for three hours of work per day for each (SGA. F. R-25. Op. 1. D. 73. L. 72).

Financial and economic part.

The book of receipts and expenditures was presented for inspection, which was simultaneously kept together for material and monetary receipts in the form of two columns, and material funds were taken into account in it only in monetary terms, while weight accounting was not carried out. The book was numbered and laced, but not secured with a seal. In addition, receipt and expenditure orders were presented. According to the book entries, the balance in monetary

units on July 1 was expressed in the amount of 10,596 rubles 23 kopecks. For June, 160,378 rubles 54 kopecks were received, 119,524 rubles 99 kopecks were spent, and the balance on July 1 was 51,449 rubles 78 kopecks. By the day of the inspection, no entries in the book for the month of July had been made, and expenses were made from the said balance on July 1, in justification of which documents were presented for 40,588 rubles 04 kopecks. The balance in cash on July 6 was thus expressed in the amount of 10,861 rubles 74 kopecks. When examining the order of keeping the book and documents, the following was noted: Among the presented documents for the amount of 40,588 rubles 04 kopecks there are unexecuted receipts of a temporary nature: for 342 rubles issued to Doctor Flerovsky as additional compensation (without a demand sheet), 2,250 rubles issued to pay off the employees of the Yermolov medical center (until the receipt of a demand sheet with receipts), 4,500 rubles issued under a contract in payment for firewood (there was no act on the acceptance of firewood).

The book entries did not contain references to receipts and expenditure orders, which made both verification and any kind of certificates difficult, and in general the order system lost all meaning. When checking the accuracy of receipt documents under article 165 of the book, it was noted that there was no receipt document for 30,000 rubles received from the Black Sea District Health Department. It was later established that receipt documents for the amounts received were only a rare occurrence, and money from both the Black Sea Health Department and the Sochi Executive Committee and the insurance fund arrived in the overwhelming majority of cases without any accompanying papers (SGA. F. R-25. Op. 1. D. 73. L. 72).

It is worth noting separately that when reviewing the expenditure documents, extremely low salaries were noticed, paid to employees according to demand sheets, according to the approved rates. Thus, in the city hospital, the salaries of employees were as follows (Table 2).

Table 2. Salaries of medical personnel (SGA. F. R-25. Op. 1. D. 73. L. 72ob.)

№	Job title	Salary
1.	Senior Doctor	608 rubles
2.	Medical staff	430 rubles
3.	Nurse	280 rubles

However, the salaries of the employees of the department of the authorized representative of the city health department were as follows: Authorized representative of the Black Sea health department special rate 797 rubles with an increase of 200 rubles – a total of 997 rubles. Clerk of the 9th category 297 rubles with an increase of 81 rubles – a total of 378 rubles. Thus, comparing the above rates with the salaries of another institution of the People's Commissariat of Health, located in the Sochi region (SRA – Sochi resort administration), where the payment of medical personnel reached 75 rubles in gold, we can state a significant difference of up to 600%, incomprehensible and unacceptable in the same ministry and especially with similar work (SGA. F. R-25. Op. 1. D. 73. L. 72ob.).

In the part of the material and inventory reporting there were inventories of the inventory property of the institutions subordinate to the authorized person. The exclusion of unsuitable property was carried out according to the act of the commissions established by the authorized Black Sea health department for the Sochi region.

City pharmacy.

The pharmacy staff consisted of 6 employees. The pharmacy kept monthly turnover sheets to record the receipt and expenditure of medications. When checking the durability of some medications and comparing them with the data on the sheet, the commission established the following (Table 3).

Table 3. Availability of medicines in the city pharmacy (SGA. F. R-25. Op. 1. D. 73. L. 72ob.)

№	Medicines	Balance as of July 1, 1923 according to documents
1.	Codeine	36 grams
2.	Cocaine	11
3.	Norzin	91,5

№	Medicines	Balance as of July 1, 1923 according to documents
4.	Santonin	9,3
5.	Argentum nitr.	97,5
6.	Thiokol	544
7.	Calcium chloride.	960
8.	Quinine	–

The pharmacy's financial receipts for June 1923 amounted to 24,799 rubles 56 kopecks, and due to the increase in the fee to 17,000 rubles, they fell in the second part of the month (SGA. F. R-25. Op. 1. D. 73. L. 72ob.).

City hospital.

The staff as of July 12, 1923, consisted of 22 employees. At the same time, 21 people were being treated in the hospital, 13 of whom were treated at the expense of the insurance fund and 8 from other categories. According to the type of disease, the patients were divided into 6 malaria, 14 non-infectious and 1 woman in labor. According to the presented book of inventory, the hospital had the following stock of linen (Table 4).

Table 4. Linen supply for the city hospital (SGA. F. R-25. Op. 1. D. 73. L. 72ob.)

№	Type of linen	Number of linen
1.	Blankets	193
2.	Sheets	171
3.	Men's shirts	53
4.	Towels	160
5.	Pillowcases	76
6.	Men's underpants	80

The stock of dressings was: 6 gross of bandages (1 gross is equal to 144 bandages). The stock of medicines was sufficient for 1-2 months. According to the presented food book, on July 12 there were: 6 pounds of sugar, 4.7 pounds of vegetable oil. As can be seen from this data, the city hospital did not have any stock and lived mainly on what was purchased for each day. There was only a small stock of potatoes in the hospital storeroom. Lunch on July 12 was: for patients of the insurance fund – green borscht and zucchini with meat and rice, 1.5 pounds of bread. For other patients – green borscht and porridge, 1 pound of bread. The general daily norm for insurance patients was up to 3,300 calories and other patients up to 2,300 calories. However, this food standard was insufficient and the amount spent on the table for general hospitals in the amount of 12 rubles was extremely low (SGA. F. R-25. Op. 1. D. 73. L. 73).

The hospital premises required repairs, whitewashing had not been done for the last 3 years. The sewerage and water supply did not work. The kitchen and laundry were in an extremely unsatisfactory condition and also required repairs. The bathroom in the city hospital did not work, stagnant water flowed into the Kuropatkinsky ditch, an open ditch running through the city, flowing into the Sochi River. In addition to the cash, food and food books for the economic part, monthly statements were kept on the movement of inpatients and outpatients. Separately for patients of the insurance fund, Red Army soldiers (military) and malaria patients (SGA. F. R-25. Op. 1. D. 73. L. 73).

City children's home (orphanage).

Data on the number of staff and pupils of the orphanage are presented in Table 5.

Table 5. Data on staff and pupils of the children's home (SGA. F. R-25. Op. 1. D. 73. L. 73)

№	Staff and pupils	Number of people
1.	Staff	10
2.	Children	16 (in the age category from 1 year to 6 years)

The premises of the children's home were kept in good order and cleanliness. As the commission noted: "the children looked contented and well-fed". The dinner consisted only of plant food, there was no meat. The children's home had a small farm consisting of two goats, rabbits and chickens. The children's linen was kept in good condition: the washing was quite satisfactory. The general impression of the children's home, as the commission noted, "was positive". (SGA. F. R-25. Op. 1. D. 73. L. 73).

Surgical Department of the City Hospital (referred to as a separate unit).

The head of the surgical department was the well-known Sochi doctor A.L. Gordon. As of July 15, 1923, the surgical department staff consisted of 13 employees. There were 10 patients, two of whom were treated at the expense of the insurance fund and 8 patients were treated at their own expense. The surgical department was designed for 15 places, with the possibility of deploying up to 30 places if necessary. The price for each patient was 25 rubles, and a separate fee was charged for procedures according to the established prices (SGA. F. R-25. Op. 1. D. 73. L. 73).

The department kept a cash-income-expense book. According to the records for the month of June, there were 6619 rubles in income and 6672 rubles 50 kopecks in expenses. The employees received their salaries from the authorized health department of the city of Sochi. Data on linen provision are presented in Table 6.

Table 6. Linen supply for the surgical department (SGA. F. R-25. Op. 1. D. 73. L. 73)

№	Type of linen	Numbers of linen
1.	Sheets	30
2.	Towels	29
3.	Men's shirts	41
4.	Blankets	69

It should be noted that, according to the commission's conclusion, there was insufficient linen for patients in the surgical department. The hospital surgery was supplied with medicines and dressings for 2-3 months. The unsatisfactory condition of the premises, which needed repair (walls, roof and partially floor coverings) was also noted (SGA. F. R-25. Op. 1. D. 73. L. 73).

5. Conclusion

Thus, based on the conducted research, it can be concluded that the health care sector of the city of Sochi in 1923 was in an unsatisfactory state, since almost all city social institutions had serious problems. In a positive way, it is worth noting only the orphanage, which, although in good condition, still could not fully service its pupils (which is clearly seen from the example of the vegetarian diet of children).

The following aspects can be highlighted here:

1. The condition of medical institutions in the city of Sochi (the city hospital and its surgical department) required significant repairs, updating of inventory equipment, and improving nutrition for patients.
2. The financial statements were in an unsatisfactory state and required bringing them into proper order.
3. Also, as the commission noted, the treatment of patients was commercialized, which was contrary to the new ideology of the country and required an urgent change to completely free medical care for the city's population.

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Unlocking the Power of Soybeans: A Promising Ally in Cancer Prevention and Management

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Abstract

Cancer is a huge worldwide health concern, and dietary treatments have gained importance as a viable tool for prevention and management. Soybeans, rich in isoflavones and other bioactive chemicals, have been widely examined for their anticancer potential. This review synthesizes current studies on the role of soybeans in cancer prevention and treatment, emphasizing their bioactive components, modes of action, and therapeutic implications. Soy isoflavones, notably genistein and daidzein, display antioxidant, anti-inflammatory, and anticancer effects, reducing cancer cell growth, inducing apoptosis, and lowering angiogenesis. Epidemiological studies have repeatedly linked increased soy diet to lower chances of hormone-related malignancies, including breast and prostate cancer. The mechanisms behind these benefits include control of estrogen metabolism, antioxidant capabilities, and immune system stimulation. Furthermore, the incorporation of soy isoflavones with traditional cancer therapy has been recommended to boost therapeutic effectiveness while lowering toxicity. This analysis shows the potential of soybeans as a beneficial component in dietary regimens for cancer prevention and control, with implications for individualized dietary advice and integrative oncology.

Keywords: soybeans, isoflavones, anticancer properties, breast cancer, prostate cancer, dietary intervention.

1. Background to the Study

The incidence of cancer continues to rise annually despite advancements in detection and treatment (Wilkinson, Gathani, 2022). This increasing prevalence has prompted extensive research into alternative preventive and therapeutic strategies. Among these approaches, nutritional interventions have gained attention due to their accessibility, affordability, and potential for integration into daily dietary habits (Chatterjee et al., 2021). One dietary component that has attracted significant scientific interest is soybeans. Traditionally revered as a staple food in numerous cultures, soybeans are now recognized for their rich composition of bioactive compounds with promising anticancer properties.

Soybeans are particularly rich in isoflavones, a class of phytoestrogens that structurally and functionally resemble human estrogen. The primary isoflavones in soy-genistein, daidzein, and glycitein – bind to estrogen receptors and act as selective estrogen receptor modulators (SERMs) (Verma et al., 2024). This dual agonist-antagonist mechanism allows soy isoflavones to exert

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estrogen-like effects in low-estrogen environments, such as in postmenopausal women, while mitigating excessive estrogenic stimulation in high-estrogen conditions. Such modulation is particularly relevant in hormone-sensitive cancers, including breast and prostate cancer, where estrogen signaling plays a critical role in tumor initiation and progression (Boye et al., 2024).

Beyond hormonal regulation, soy isoflavones exhibit a broad range of biological activities, including antioxidant, anti-inflammatory, and epigenetic effects. They have been shown to inhibit cancer cell proliferation, induce apoptosis, and suppress angiogenesis, thereby interfering with key processes in tumor growth and metastasis (Ferriere et al., 2024). Additionally, soy protein itself contains bioactive peptides that may enhance immune function and support cellular repair mechanisms. These multifaceted properties make soybeans a valuable component in dietary recommendations for cancer prevention and management.

The health benefits of soybeans have been recognized for centuries, particularly in East Asian populations where soy-based foods such as tofu, miso, and soy milk are dietary staples. Epidemiological data consistently indicate lower incidences of hormone-related cancers, such as breast and prostate cancer, in regions with high soy consumption compared to Western countries (Liu et al., 2022). This cultural variation in dietary habits has spurred scientific exploration into the potential protective effects of soy. Over the past few decades, there has been a surge in research investigating the role of soybeans in cancer prevention and therapy. Meta-analyses of epidemiological studies suggest a consistent inverse relationship between soy intake and cancer risk. For instance, one comprehensive study found that an additional 25 grams of daily soy consumption was associated with a 4 % reduction in overall cancer risk, with more pronounced benefits observed for specific cancer types (Wan et al., 2022). Furthermore, randomized clinical trials have examined the safety and efficacy of soy supplementation in cancer patients, providing valuable insights into its potential as an adjuvant therapy (Wang et al., 2024).

Despite these promising findings, debates and gaps in knowledge persist. Early concerns regarding the estrogenic effects of soy isoflavones and their potential to promote hormone-dependent cancers have largely been dispelled by evidence from population-based studies and clinical trials. However, variability in individual responses to soy consumption, influenced by factors such as genetic polymorphisms and gut microbiota composition, underscores the need for personalized dietary recommendations (Ulusoy-Gezer, Rakıcıoğlu, 2024).

2. Results and discussion

Isoflavones and Cancer Modulation

Soybeans are exceptionally rich in isoflavones, a subclass of phytoestrogens that mimic human estrogen in both structure and function. The predominant isoflavones – genistein, daidzein, and glycitein – bind to estrogen receptors, acting as selective estrogen receptor modulators (Manayi, 2021). This dual agonist-antagonist mechanism enables soy isoflavones to exert estrogenic effects in low-estrogen conditions, such as postmenopausal women, while preventing excessive estrogenic stimulation in high-estrogen environments. This regulatory role is particularly crucial in hormone-sensitive malignancies, including breast and prostate cancers, where estrogen signaling significantly influences tumor development and progression (Orzołek et al., 2022).

Beyond hormonal modulation, isoflavones exhibit various biological properties, including antioxidant, anti-inflammatory, and epigenetic effects. They have been shown to inhibit cancer cell proliferation, induce apoptosis, and suppress angiogenesis, thereby disrupting essential processes in tumor progression and metastasis (Jiang et al., 2020). Additionally, soy protein contains bioactive peptides that may enhance immune function and facilitate cellular repair mechanisms. These diverse bioactivities position soybeans as a valuable component in dietary strategies for cancer prevention and control.

Isoflavones have attracted considerable interest in cancer research due to their potential chemopreventive properties. These compounds, particularly genistein and daidzein, exhibit multiple anticancer mechanisms, including anti-inflammatory, antioxidant, and anti-angiogenic effects (Daman, Miglani, n.d.). The regulation of cancer cell proliferation and apoptosis through various signaling pathways has been a focal point of numerous studies, highlighting the potential role of isoflavones in cancer prevention and treatment. Recent research has elucidated the molecular mechanisms by which isoflavones exert their anticancer effects, particularly in breast and colorectal cancers.

Genistein, one of the most extensively studied isoflavones, has been shown to inhibit cancer cell growth and induce apoptosis across various cancer types. For example, Goh et al. (2022)

demonstrated that genistein promotes apoptosis in primary cancer cells and embryonal carcinoma cells while upregulating anti-migration proteins such as p38 and p53. Similarly, studies indicate that genistein suppresses nuclear factor kappa B (NF-κB) activation, a key regulator of inflammation and cancer progression, thereby reducing cell proliferation and metastasis (Konstantinou et al., 2024; Konstantinou et al., 2024a; Tuli et al., 2019). Furthermore, research suggests that isoflavones, including genistein, influence signaling pathways associated with cancer cell survival and proliferation, such as the PI3K/AKT pathway (Tuli et al., 2019).

In breast cancer, isoflavones have demonstrated anti-estrogenic effects, which may contribute to reduced tumor growth. Qiu and Jiang (2019) reported that isoflavones inhibit estrogen synthesis and impede cell proliferation, leading to a lower risk of breast cancer recurrence. A meta-analysis by Hatono et al. (2021) supports this finding, showing that higher isoflavone intake is associated with a 17 % reduction in breast cancer risk. This protective effect is believed to be mediated through the modulation of estrogen signaling pathways, particularly in postmenopausal women with diminished endogenous estrogen levels (Xiang et al., 2021).

Isoflavones also exhibit protective effects against colorectal cancer. Studies indicate that isoflavones inhibit colorectal cancer cell proliferation by promoting apoptosis and reducing angiogenesis (Yang et al., 2021). Additionally, high dietary intake of soy isoflavones in Asian populations has been linked to a lower incidence of colorectal cancer, suggesting a potential dietary strategy for cancer prevention (Khankari et al., 2020).

Moreover, the anti-angiogenic properties of isoflavones contribute to their anticancer effects. Wei and Zhang (2024) found that isoflavones inhibit angiogenesis, thereby restricting the tumor's ability to develop a blood supply essential for growth and metastasis. This is particularly relevant in integrative oncology, where isoflavones are being explored for their potential to enhance conventional cancer therapies while minimizing associated toxicities.

Epidemiological Evidence

General Cancer Risk

Epidemiological research has increasingly identified various risk factors contributing to cancer, highlighting the intricate interactions between genetic, environmental, and lifestyle influences. This review consolidates recent findings from multiple studies to illustrate the complex nature of cancer risk.

One of the most critical lifestyle factors associated with cancer risk is tobacco use. Ullah et al. (2024) conducted a Mendelian randomization study confirming the established link between smoking and several cancers, including lung, head and neck, and bladder cancers. This association arises due to carcinogenic compounds in tobacco smoke, such as nitrosamines and polycyclic aromatic hydrocarbons. These findings align with other research, which consistently demonstrates that smoking remains a primary modifiable risk factor for cancer, particularly lung cancer, a leading cause of global cancer mortality (Thandra et al., 2021).

Similarly, alcohol consumption has been implicated in increased cancer risk. The same Mendelian randomization study by Sengupta et al. (2024) identified alcohol consumption as a significant risk factor for esophageal and liver cancers, reinforcing the need for public health initiatives to curb alcohol intake. Moreover, the correlation between obesity and cancer risk has gained attention. Perdomo et al. (2023) found that visceral obesity is associated with higher incidences of both cancer and cardiovascular diseases, suggesting the necessity of integrated health management strategies.

Environmental exposures also play a crucial role in cancer risk. Exposure to environmental chemicals such as DDT and polychlorinated biphenyls during critical developmental stages has been linked to an increased risk of breast cancer, although findings are not entirely consistent across all studies (Rodgers et al., 2018; Kay et al., 2022). Furthermore, occupational exposures to carcinogens contribute significantly to cancer incidence. A review by Hosseini et al. (2021) on epidemiological studies in Iran found notable associations between specific occupational exposures and cancer prevalence.

Genetic predisposition also plays a crucial role in cancer susceptibility. Recent research has explored the genetic mechanisms underlying cancer risk, including the role of vitamin D levels. Meta-analyses suggest that vitamin D supplementation may lower overall cancer incidence and mortality, particularly for digestive tract malignancies (Muñoz, Grant, 2022; Keum et al., 2019). Additionally, studies indicate that diabetes is associated with an increased risk of several cancers, underscoring the importance of metabolic health in cancer prevention (Wang et al., 2020; Abudawood, 2019; Wang, Ding, 2021).

Role of Soybeans in Breast Cancer

The potential role of soy in breast cancer prevention and prognosis has been extensively debated, primarily due to soy's interaction with hormone receptors. This interaction is largely attributed to phytoestrogens, specifically isoflavones, which possess estrogen-like properties. As breast cancer is often hormone-sensitive, researchers have investigated how soy consumption influences breast cancer risk and outcomes (Messina, 2016; Boutas et al., 2022; Fritz et al., 2013; Fraser et al., 2020).

A large-scale study using data from over 300,000 women enrolled in the China Kadoorie Biobank examined the relationship between soy intake and breast cancer risk. The study found no significant association between moderate soy consumption and breast cancer incidence, suggesting that moderate soy intake may not substantially influence breast cancer risk (Wei et al., 2020). This finding may be influenced by cultural dietary habits, where soy is commonly consumed as part of a balanced diet, potentially confounding the results.

However, a dose-response meta-analysis provided a more nuanced perspective. This analysis found that each 10 mg/day increment in soy isoflavone intake was associated with a 3 % reduction in breast cancer risk (Zhang et al., 2020). This suggests that even small increases in soy isoflavone consumption could have protective effects against breast cancer. The results support the hypothesis that soy isoflavones exert a modest yet significant impact on cancer risk, particularly in populations with traditionally low soy intake.

The benefits of soy may extend beyond prevention to post-diagnosis outcomes. Research by Nechuta et al. (2012) indicated that post-diagnosis soy consumption was associated with improved survival rates and reduced recurrence in breast cancer patients. While the exact mechanisms remain unclear, the antioxidative and anti-inflammatory properties of soy isoflavones likely contribute to cancer suppression.

The role of soybeans, particularly their isoflavones, in breast cancer prevention and treatment has gained considerable attention. Isoflavones such as genistein and daidzein mimic estrogen and are abundant in soy products (Kim, 2021). Epidemiological studies suggest that higher soy consumption correlates with reduced breast cancer risk, particularly in Asian populations, where soy is a dietary staple (Chen et al., 2022; Şahin et al., 2019; Tian et al., 2015). This protective effect is attributed to mechanisms such as estrogen metabolism modulation, antioxidant properties, and immune enhancement (Amaral et al., 2017).

Studies also indicate that soy isoflavones may inhibit estrogen-dependent breast cancer cell proliferation by binding to estrogen receptors (Amaral et al., 2017). A systematic review found that higher soy consumption correlates with a lower risk of breast cancer and improved prognosis, regardless of menopausal status (Lei et al., 2020). Additionally, soy isoflavones may reduce the production of reactive oxygen species (ROS), which are implicated in cancer progression (Sim et al., 2020).

The timing of soy consumption is crucial. Evidence suggests that high soy intake during adolescence and early adulthood significantly reduces breast cancer risk later in life (Wei, Zhang, 2024). This is supported by a large prospective study involving 300,000 Chinese women, which found an inverse relationship between soy intake and breast cancer risk (Wei, Zhang, 2024). However, individual factors such as genetic predisposition and estrogen receptor status may influence the effects of soy consumption (Lee et al., 2021).

Despite promising evidence, inconsistencies remain in the literature regarding soy's protective effects against breast cancer. Variations in study design, population characteristics, and dietary assessment methods may contribute to these discrepancies. A meta-analysis found that while high soy isoflavone intake generally reduces breast cancer risk, the association is weaker in Western populations compared to Asian populations, where soy consumption is higher (Blázovics et al., 2022). Moreover, the interaction between soy isoflavones and breast cancer treatments, such as tamoxifen, requires further investigation. Some studies suggest that isoflavones enhance tamoxifen's efficacy, while others indicate potential adverse effects, highlighting the need for additional research (Blázovics et al., 2022).

Prostate Cancer

The potential protective role of soy in prostate cancer has garnered considerable attention, with research suggesting that regular consumption of soy may significantly reduce the risk of developing this common malignancy (Applegate et al., 2018). Prostate cancer is known to be heavily influenced by androgenic hormones, particularly testosterone, and the androgen receptor

(AR) pathway plays a critical role in both the development and progression of the disease (Vickman et al., 2020). Consequently, dietary interventions that can modulate this pathway have been the subject of extensive research, and soy, with its bioactive compounds, particularly isoflavones, has emerged as a notable candidate for such interventions.

A meta-analysis by Applegate et al. (2018) synthesized data from multiple studies and found that regular soy intake was associated with a reduction in prostate cancer risk by approximately 25 %. This finding is consistent across several population-based studies, highlighting soy's potential as a protective food in the context of prostate cancer. The mechanisms underlying this protective effect are thought to be linked to the bioactive compounds found in soy, particularly the isoflavones genistein and daidzein, which have been shown to interact with multiple biological pathways involved in cancer development.

One of the key mechanisms through which soy isoflavones are believed to exert their protective effects is by modulating androgen receptor activity (Ferriere et al., 2024). Androgens, such as testosterone, bind to androgen receptors on prostate cancer cells, promoting tumor growth and survival. Isoflavones, specifically genistein, have been shown to suppress androgen receptor activity, which may, in turn, reduce the growth-promoting effects of androgens on prostate cancer cells (Manayi, 2021). This suppression of androgen receptor activity suggests that soy consumption could be particularly beneficial for individuals with hormone-sensitive prostate cancer, where androgens drive disease progression.

Another important factor in prostate cancer progression is the expression of prostate-specific antigen (PSA), a protein produced by the prostate gland. Elevated PSA levels are often used as a biomarker for prostate cancer diagnosis and prognosis (Kim, 2021). Isoflavones, particularly genistein, have been shown to inhibit PSA expression, potentially slowing tumor progression and enhancing the effectiveness of other therapeutic strategies. This inhibitory effect on PSA could serve as a marker of soy's potential role in controlling prostate cancer growth, offering both preventative and therapeutic benefits.

Although the protective role of soy in prostate cancer is promising, it is essential to recognize that the effects may vary depending on factors such as genetics, lifestyle, and the form in which soy is consumed. For example, whole soy foods may have a different impact than isolated soy isoflavones, and the bioavailability of isoflavones may vary between individuals (Khankari et al., 2020). Nonetheless, the cumulative body of evidence suggests that incorporating soy into the diet could offer significant benefits in reducing the risk of prostate cancer, particularly when consumed regularly as part of a balanced diet (Verma et al., 2024).

Isoflavones, particularly genistein and daidzein, have been identified as key components contributing to the anticancer properties of soy. These compounds exhibit various biological activities, including antiproliferative and antigenotoxic effects on prostate cancer cells (Liu et al., 2022). The mechanisms through which isoflavones exert their effects include modulation of cell cycle regulation, induction of apoptosis, and inhibition of angiogenesis and metastasis (Wei, Zhang, 2024). For example, genistein has been shown to inhibit the activity of Polo-like kinase 1 (PLK1), a protein involved in cancer progression, thereby reducing the proliferation of cancer cells (Wei, Zhang, 2024). Furthermore, studies have demonstrated that isoflavones can enhance the efficacy of certain cancer therapies, suggesting a potential role in integrative oncology (Liu et al., 2022).

The relationship between soy consumption and prostate cancer is further supported by findings from clinical trials. A randomized controlled trial involving a fermented soy beverage indicated promising results in reducing prostate cancer markers among patients prior to radical prostatectomy (Applegate et al., 2018). Additionally, a prospective study from Japan highlighted that higher intake of soy products was associated with lower mortality rates from prostate cancer, emphasizing the potential protective effects of soy in this context (Khankari et al., 2020).

Moreover, the bioavailability and metabolism of soy isoflavones can be influenced by gut microbiota, which may convert these compounds into more bioactive forms, such as equol, enhancing their anticancer effect (Jiang et al., 2020). This interplay between diet, microbiota, and cancer risk underscores the complexity of dietary interventions in cancer prevention.

Despite the promising evidence, some studies suggest that the relationship between soy and prostate cancer may not be straightforward. For instance, certain research indicates that the protective effects of soy may vary depending on the stage of cancer and individual metabolic responses to isoflavones (Khankari et al., 2020). This highlights the necessity for further research to elucidate the conditions under which soy consumption may confer protective benefits against prostate cancer.

Lung Cancer

The intake of soy products has been associated with a reduced risk of several cancers, including lung cancer. A meta-analysis by Fan et al. (2022) found that increased dietary intake of soy isoflavones correlates with a lower incidence of lung cancer among various populations. This finding is supported by Bu (2023), who notes an inverse relationship between soybean consumption and cancer risks, including lung cancer, highlighting the protective effects of soy in dietary patterns. The potential mechanisms behind these protective effects include the modulation of inflammatory pathways and the regulation of gene expression related to cancer progression, as indicated by Talvan et al. (2022).

The beneficial effects of soybeans extend beyond isoflavones. Recent studies have shown that soybean proteins and peptides also exhibit protective properties against chronic diseases, including cancer. Wang et al. (2024) report that specific peptides derived from soy can inhibit the proliferation of non-small cell lung cancer cells by affecting cell cycle regulation and signaling pathways. This suggests that the consumption of soy may not only prevent the onset of lung cancer but also impede its progression.

In addition to the direct effects of soy on cancer cells, the role of nutrition in modulating the tumor microenvironment is increasingly recognized. Dietary factors, including those found in soy, can influence adiponectin levels, which have been linked to cancer prevention (Janiszewska et al., 2021).

Mechanisms of action

Soy's potential protective effects against cancer have been extensively studied, particularly with regard to the bioactive isoflavones found in soy, such as genistein and daidzein (Kim, 2021; Chen et al., 2022; Sahin et al., 2019; Tian et al., 2015; Amaral et al., 2017; Lei et al., 2020). These isoflavones are thought to exert their anticancer properties through a variety of mechanisms, including antioxidant activity and modulation of critical cell signaling pathways. The ability of isoflavones to interact with these molecular processes plays a significant role in their potential as cancer-preventive agents. The most studied isoflavone, genistein, is recognized for its potential to inhibit cancer cell proliferation and induce apoptosis, making it a focal point in research on dietary cancer prevention strategies (Sharifi-Rad et al., 2021). Genistein, the predominant isoflavone in soybeans, has been shown to exert anticarcinogenic effects through multiple pathways. It inhibits receptor tyrosine kinase (RTK)-mediated signaling pathways, which are crucial for cell proliferation and angiogenesis (Sharifi-Rad et al., 2021). Furthermore, genistein's structural similarity to estrogen allows it to bind to estrogen receptors, thereby modulating estrogen-related pathways that are often implicated in hormone-dependent cancers, such as breast and ovarian cancer (Sharifi-Rad et al., 2021). Epidemiological studies have consistently linked high soy consumption with reduced risks of breast cancer, particularly in Asian populations, where dietary patterns include significant amounts of soy (Shin et al., 2023; Cao et al., 2022).

a. Antioxidant Activity

One of the primary mechanisms through which soy isoflavones exert protective effects against cancer is through their antioxidant activity (Kim, 2021). Isoflavones, particularly genistein, have been shown to scavenge free radicals and reduce oxidative stress, which is a key factor in the initiation and progression of cancer. Free radicals are highly reactive molecules that can cause cellular damage by interacting with DNA, proteins, and lipids (Alkhadi, 2020). This damage, if not repaired, can lead to mutations and genomic instability, which are critical steps in the development of cancer (Tubbs, NUssenweiz, 2017). By neutralizing these harmful free radicals, soy isoflavones prevent DNA damage and, therefore, help to reduce the risk of carcinogenesis. The antioxidant properties of soy isoflavones are particularly important in the context of cancers that are driven by oxidative stress, such as lung, prostate, and breast cancers. Oxidative stress has been implicated in a range of cellular processes that contribute to cancer, including inflammation, cell proliferation, and resistance to apoptosis (programmed cell death). By mitigating oxidative damage, soy isoflavones may help to protect cells from becoming malignant and inhibit the progression of early-stage tumors.

Research by Lambert et al. (2007) highlighted the role of isoflavones in reducing oxidative stress. Their findings suggest that genistein and daidzein can directly scavenge free radicals and inhibit the production of reactive oxygen species (ROS), thereby reducing the overall oxidative burden on cells. This action is crucial for maintaining cellular integrity and preventing the initiation of cancerous transformations. Soybeans are rich in bioactive compounds, particularly isoflavones, phenolics, and flavonoids, which contribute to their antioxidant capacity. Isoflavones

such as genistein and daidzein have been extensively studied for their health benefits, including their ability to scavenge free radicals and inhibit cancer cell proliferation (Sharifi-Rad et al., 2021; Wójciak et al., 2024). The antioxidant activity of soybeans is often assessed using various in vitro assays, such as DPPH radical scavenging and FRAP (Ferric Reducing Antioxidant Power) assays, which provide insights into their efficacy in neutralizing oxidative species (Nwachukwu et al., 2021). Research indicates that the antioxidant potential of soybeans varies significantly with seed coat color, suggesting that specific cultivars may offer enhanced protective effects against oxidative damage (Wójciak et al., 2024; Nwachukwu et al., 2021).

Fermentation processes have been shown to enhance the antioxidant properties of soybeans. Studies demonstrate that fermenting soybeans with specific microbial strains, such as Bacillus spp. and Pleurotus cornucopiae, significantly increases their total phenolic content and antioxidant activity (Akyuz et al., 2023, Hamad et al., 2022). This enhancement is attributed to the breakdown of complex compounds into simpler, more bioavailable forms, which can exhibit stronger antioxidant effects (Akyuz et al., 2023). For example, fermented soybean products like tempeh have been linked to improved antioxidant activity, which may contribute to their protective effects against degenerative diseases, including cancer (Ojao et al., 2022).

Moreover, germination of soybeans has been identified as another method to boost their antioxidant capacity. Germination increases the levels of bioactive compounds, including isoflavones and phenolic acids, which are associated with enhanced antioxidant activity (Król-Grzymała, Amarowicz, 2020). This process not only improves the nutritional profile of soybeans but also their potential in cancer prevention by reducing oxidative stress and inflammation, both of which are critical factors in cancer development.

Recent metabolomic analyses have revealed that domestication has altered the polyphenolic profiles of soybean seeds, affecting their antioxidant activities (Ullah et al., 2024). Wild soybeans, for instance, exhibit a higher diversity of polyphenolic compounds, which may contribute to their superior antioxidant properties compared to cultivated varieties (Li et al., 2023). This finding underscores the importance of genetic diversity in optimizing the health benefits of soybeans.

b. Modulation of Signaling Pathways

In addition to their antioxidant properties, soy isoflavones also influence critical cell signaling pathways that regulate cell survival, proliferation, and apoptosis. Among the most important pathways affected by isoflavones are the PI3K/AKT and MAPK pathways, both of which are involved in controlling cell cycle progression, survival signals, and responses to stress (Gupta et al., 2021).

The PI3K/AKT signaling pathway is crucial for promoting cell survival and growth. In many cancers, this pathway is dysregulated, leading to uncontrolled cell proliferation and resistance to apoptosis (He et al., 2021). Genistein, a major isoflavone found in soy, has been shown to inhibit the PI3K/AKT pathway, leading to reduced cell survival and growth. By blocking this pathway, genistein can help to restore normal cell-cycle regulation and promote the death of cancer cells, thereby preventing tumor growth and metastasis.

Similarly, the MAPK pathway, which regulates cell proliferation and differentiation, can be modulated by soy isoflavones (Zhang et al., 2020). Dysregulation of MAPK signaling is often observed in various cancers, contributing to unchecked cellular growth and survival. Isoflavones like genistein and daidzein can influence the MAPK pathway, thereby inhibiting cancer cell proliferation and inducing apoptosis (Konstantinou et al., 2024). Moreover, genistein's ability to inhibit tyrosine kinases, which are enzymes that regulate various signaling pathways, further enhances its anticancer potential. Tyrosine kinases play a critical role in signaling networks that control cellular processes such as proliferation, differentiation, and apoptosis (Konstantinou et al., 2024; Chae et al., 2019). By inhibiting these kinases, genistein can reduce the growth of cancer cells and promote the induction of apoptosis. This inhibition of tyrosine kinases contributes to the overall anticancer effects of soy and highlights the importance of genistein in cancer prevention and therapy.

Isoflavones, such as genistein and daidzein, are phytoestrogens that mimic estrogen and interact with estrogen receptors (ERs) in the body. Research indicates that these compounds can induce apoptosis in cancer cells, particularly in prostate cancer models. For instance, Sivoňová et al. (2019) demonstrated that soybean extract containing isoflavones at a concentration of 25 µmol/L significantly increased apoptosis in prostate cancer cells compared to individual isoflavones. Furthermore, the estrogenic activity of isoflavones has been linked to their ability to

modulate signaling pathways associated with cell proliferation and survival, suggesting a dual role in both promoting and inhibiting cancer cell growth depending on the context (Kaufman-Szymczyk et al., 2024).

In addition to isoflavones, peptides derived from soybeans, such as lunasin, have shown promising anticancer properties. Lunasin has been reported to inhibit the proliferation of colorectal cancer cells by inducing apoptosis and modulating cell cycle progression (Kaufman-Szymczyk et al., 2024). Its mechanism of action involves the downregulation of key signaling pathways that promote tumor growth, including the epidermal growth factor receptor (EGFR) pathway (Fernández-Tomé et al., 2020). Phenolic compounds in soybeans contribute to their anticancer effects by exerting antioxidant properties and modulating inflammatory pathways. These compounds can inhibit the expression of cyclooxygenase-2 (COX-2), a key enzyme involved in inflammation and cancer progression (Zappavigna et al., 2020). The anti-inflammatory effects of soy phenolics are crucial in preventing the initiation and promotion of cancer, as chronic inflammation is a well-established risk factor for various malignancies (Kim et al., 2021).

The epigenetic effects of soybean consumption, particularly maternal exposure to genistein, have also been investigated for their long-term implications on cancer risk in offspring. Chen et al. found that maternal genistein exposure could lead to inherited epigenetic changes that lower breast cancer risk in later life (Chen et al., 2022). This highlights the importance of dietary components in shaping cancer susceptibility through epigenetic mechanisms.

c. Epigenetic Regulation

Epigenetic regulation plays a pivotal role in controlling cellular processes such as cell differentiation, proliferation, and apoptosis. In the context of cancer, these processes are often disrupted, leading to uncontrolled cell growth and resistance to cell death (Matthews et al., 2022). Epigenetic changes, such as the silencing of tumor suppressor genes or the activation of oncogenes, can drive the initiation and progression of cancer (Chatterjee et al., 2018).

DNA methylation, a key epigenetic modification, involves the addition of a methyl group to the DNA molecule, typically at cytosine residues in CpG dinucleotides (Acharjee et al., 2023). This modification can lead to the silencing of genes, including those involved in tumor suppression, making it a critical player in carcinogenesis. Similarly, histone modifications, which include methylation, acetylation, and phosphorylation, can alter the structure of chromatin and affect gene expression by making the DNA more or less accessible to the transcriptional machinery (Zhao, Malik, 2022). In cancer cells, abnormal DNA methylation and histone modifications often contribute to the dysregulation of critical genes that control cell growth and survival.

Role of Isoflavones in Epigenetic Modulation

Isoflavones, particularly genistein, have been shown to influence both DNA methylation and histone modification processes, making them important modulators of gene expression in cancer cells (Sharma et al., 2021). One of the key mechanisms through which genistein impacts epigenetic regulation is by inhibiting DNA methyltransferases (DNMTs), the enzymes responsible for adding methyl groups to DNA (Akone et al., 2020). By inhibiting DNMTs, genistein can prevent the silencing of tumor suppressor genes, such as p53, which play a critical role in regulating the cell cycle and inducing apoptosis in response to cellular stress. The reactivation of these genes may help to restore normal cellular function and prevent the transformation of normal cells into cancerous ones.

Furthermore, genistein has been shown to influence histone modifications, which can alter the chromatin structure and affect gene expression (Dutta et al., 2018). By modulating histone acetylation and methylation, genistein can promote a more open chromatin structure that favors the expression of tumor suppressor genes. This effect is particularly important in cancer cells, where histone modifications are often altered, leading to the silencing of critical genes involved in growth regulation (Perri et al., 2017). Through its ability to modify histone marks, genistein can help to reverse these changes and promote the expression of genes that inhibit tumor growth. Soy isoflavones, particularly genistein, could modify the expression of genes involved in cell cycle regulation and apoptosis through epigenetic mechanisms (Sharma et al., 2021). The researchers found that genistein's ability to alter DNA methylation and histone modifications contributed to its anticancer effects, particularly by reactivating the expression of genes that suppress tumor growth.

Isoflavones and Oncogenesis

Isoflavones not only affect tumor suppressor genes but can also influence oncogenes, which are genes that, when activated, promote cancer cell proliferation and survival (Ziaei, Halaby, 2017). Epigenetic silencing of tumor suppressor genes and the activation of oncogenes are common events

in the progression of many cancers. Moreover, the ability of soy isoflavones to modulate the expression of key regulatory genes through epigenetic mechanisms may also influence other processes involved in cancer, such as angiogenesis, metastasis, and immune surveillance (Eren et al., 2024). Angiogenesis, the formation of new blood vessels, is a critical process for tumor growth and metastasis. By modulating gene expression related to angiogenesis, soy isoflavones could potentially inhibit the ability of tumors to establish a blood supply, thereby limiting their growth and spread (Ajdžanovic et al., 2019). Additionally, by influencing immune-regulatory genes, isoflavones may enhance the immune system's ability to recognize and eliminate cancer cells.

Isoflavones, particularly those derived from soybeans, have garnered significant attention in the context of cancer prevention due to their diverse biological activities and mechanisms of action. Isoflavones such as genistein and daidzein are recognized for their phytoestrogenic properties, which allow them to interact with estrogen receptors (ERα and ERβ) and modulate various signaling pathways involved in oncogenesis (Kaufman-Szymczyk et al., 2024; Messina et al., 2022). This inhibition leads to decreased expression of proteins that promote cancer cell proliferation, such as cyclin D1 and PCNA, while enhancing the expression of cell cycle inhibitors like p21 and p27 (Singh et al., 2017). Additionally, isoflavones can induce apoptosis in cancer cells by activating caspases and modulating the expression of pro-apoptotic and anti-apoptotic proteins (Jeong et al., 2024).

Moreover, isoflavones have demonstrated the ability to inhibit the activity of various enzymes involved in cancer progression, such as protein tyrosine kinases and topoisomerases (Sarkar et al., 2021; Ivashkevich, 2023). These enzymes play critical roles in cell signaling and DNA replication, respectively, and their inhibition can lead to reduced tumor growth and enhanced sensitivity to chemotherapeutic agents (Coutinho et al., 2023). For example, studies have indicated that genistein can enhance the efficacy of radiotherapy by sensitizing cancer cells to radiation while protecting normal tissues from radiation-induced damage (Komorowska et al., 2022).

The antioxidant properties of isoflavones also contribute to their anticancer effects. By scavenging reactive oxygen species (ROS) and reducing oxidative stress, isoflavones can mitigate DNA damage that may lead to cancer initiation and progression (Sarkar et al., 2021). Furthermore, the anti-inflammatory effects of isoflavones, mediated through the inhibition of nuclear factor-κB (NF-κB) signaling, can reduce the chronic inflammation associated with cancer development (Subedi et al., 2019).

Epidemiological studies have supported the protective role of isoflavones against various cancers, particularly hormone-related cancers such as breast and prostate cancer. Populations with high soy consumption, such as those in Asia, exhibit lower incidences of these cancers compared to Western populations (Messina et al., 2022). This correlation underscores the potential of dietary isoflavones as chemopreventive agents.

Soy Combination Therapies for Cancer Treatment

The integration of soy-based interventions, particularly soy isoflavones such as genistein and daidzein, into cancer treatment has gained significant attention. These phytoestrogens exhibit estrogen-like activity and interact with molecular pathways involved in cancer progression (Goleij et al., 2024; Ivashkevich, 2023). As adjuncts to conventional therapies, including chemotherapy, radiation therapy, and immunotherapy, soy isoflavones have shown potential in enhancing therapeutic efficacy and mitigating treatment-related side effects. However, further research is needed to confirm their safety and effectiveness (Ivashkevich, 2023).

The anticarcinogenic properties of soy isoflavones stem from their dual role in hormonal modulation and antioxidant activity. Isoflavones can bind to estrogen receptor beta (ERβ), inhibiting estrogen receptor alpha (ERα), which is often associated with tumor growth in hormone-sensitive cancers like breast and ovarian cancers (Goleij et al., 2024). Epidemiological studies have consistently linked higher dietary intake of soy to reduced risks of breast, prostate, and ovarian cancers, especially in populations with high soy consumption (Messina et al., 2022).

Soy isoflavones also exhibit antioxidant properties, scavenging free radicals and reducing oxidative stress, a known contributor to cancer development (Sarkar et al., 2021). These compounds enhance the activity of antioxidant enzymes and modulate inflammatory pathways, mitigating the risk of cancer associated with chronic inflammation (Subedi et al., 2019). These properties make soy isoflavones promising candidates for integrative oncology, where they may complement conventional therapies to enhance efficacy and reduce toxicity (Ivashkevich, 2023).

Beyond improving therapeutic efficacy, soy isoflavones may alleviate treatment-related side effects. Genistein, for instance, exhibits anti-inflammatory properties that help reduce

chemotherapy-induced inflammation and tissue damage (Goleij et al., 2024). These protective effects contribute to better patient tolerance and quality of life during treatment.

Soy isoflavones are particularly effective in hormone-sensitive cancers, such as breast and prostate cancer. Their estrogenic activity can counteract endogenous hormones that promote tumor growth. Meta-analyses have shown that higher intake of soy-based foods is associated with reduced recurrence rates in breast cancer (Messina et al., 2022). However, individual responses to soy isoflavones vary due to genetic polymorphisms and gut microbiome differences, which influence their metabolism and bioavailability (Ashrafi-Dehkordi et al., 2024). This variability underscores the importance of personalized approaches to incorporating soy-based therapies into cancer treatment.

Soy Isoflavones in Combination with Radiation Therapy

Radiation therapy is another common treatment for cancer, but it can cause significant damage to normal tissues surrounding the tumor, leading to side effects such as skin irritation, fatigue, and organ dysfunction. Research suggests that soy isoflavones, particularly genistein, may be able to enhance the therapeutic effects of radiation therapy while also reducing its toxicities (Goleij et al., 2024).

Genistein has been shown to have radiosensitizing properties, meaning that it can increase the sensitivity of cancer cells to the damaging effects of radiation. By inhibiting the repair of radiation-induced DNA damage, genistein may enhance the cytotoxicity of radiation, leading to greater tumor cell death. Genistein increased the radiosensitivity of human prostate cancer cells, making them more susceptible to radiation-induced apoptosis (Komorowska et al., 2022). This sensitization was mediated through the inhibition of the PI3K/AKT pathway, which is often activated in cancer cells to promote survival after radiation.

Soy Isoflavones in Combination with Immunotherapy

Immunotherapy, which harnesses the body's immune system to fight cancer, has revolutionized cancer treatment in recent years. However, not all patients respond to immunotherapy, and the mechanisms underlying this resistance are still being explored (Bai et al., 2020). There is growing interest in the potential of soy isoflavones to enhance the effectiveness of immunotherapy, particularly by modulating immune system activity.

Genistein has been shown to modulate the immune response in several ways. It can enhance the activity of immune cells, such as T cells and natural killer (NK) cells, which are critical for recognizing and destroying cancer cells (Goleij et al., 2024). Genistein has also been shown to increase the production of cytokines, signaling molecules that help coordinate the immune response (Čoma et al., 2021). This immunomodulatory effect may help boost the effectiveness of immunotherapies, such as checkpoint inhibitors, which rely on stimulating the immune system to recognize and attack cancer cells.

In addition to their use in combination with conventional therapies, soy isoflavones may also have synergistic effects when combined with other natural compounds that possess anticancer properties (Mia et al., 2023). For example, studies have investigated the combined use of genistein with curcumin, a compound found in turmeric, which has well-documented anti-inflammatory and anticancer effects. A study by Mia et al. (2023) found that the combination of genistein and curcumin synergistically inhibited the growth of prostate cancer cells and promoted apoptosis. This combination worked through multiple mechanisms, including the suppression of NF-kB signaling, which is often activated in cancer cells to promote survival and metastasis. By combining genistein with other natural compounds like curcumin, it may be possible to enhance the overall anticancer effect while reducing the likelihood of resistance developing during treatment.

Combination of Soy with Other Plant-Based Compounds for Cancer Treatment

Research on combining soy with other plant-based compounds for cancer treatment has garnered significant interest due to the potential synergistic effects of these combinations. Soy isoflavones, particularly genistein and daidzein, have well-documented anticancer properties, including inhibiting cell proliferation, inducing apoptosis, and suppressing metastasis (Ashrafi-Dehkordi et al., 2024). When combined with other bioactive compounds found in plants, such as curcumin, green tea catechins, resveratrol, and compounds from cruciferous vegetables, these effects may be enhanced. The combination of soy with other plant-based compounds has garnered significant attention in cancer treatment due to the synergistic effects that enhance therapeutic efficacy while minimizing side effects.

Soy isoflavones have been shown to exert anti-cancer effects through multiple mechanisms, including the modulation of cell signaling pathways, induction of apoptosis, and inhibition of tumor growth. For instance, studies indicate that soy isoflavones can influence the expression of genes involved in cell cycle regulation and apoptosis, thereby promoting cancer cell death (Sauter, 2020). Furthermore, the incorporation of soy isoflavones in combination therapies has been reported to enhance the sensitivity of cancer cells to conventional chemotherapeutics, leading to improved therapeutic outcomes (Wang et al., 2021). This is particularly relevant in the context of resistant cancer types, where traditional therapies often fail to achieve desired results.

Moreover, the immunomodulatory effects of soy and its phytochemicals contribute to their therapeutic potential. Studies have indicated that soy isoflavones can enhance immune responses, which may play a role in tumor suppression and prevention of metastasis (Kaufman-Szymczyk et al., 2024). This is particularly important as effective cancer therapies not only target tumor cells but also aim to bolster the body's immune system to fight cancer more effectively.

Soy Isoflavones and Curcumin

Curcumin, a bioactive compound found in turmeric, is known for its anti-inflammatory, antioxidant, and anticancer properties. Research has explored the synergistic effects of combining curcumin with soy isoflavones, particularly genistein, for enhanced anticancer outcomes. Curcumin works by inhibiting key signaling pathways involved in cell survival and proliferation, such as NF-kB, PI3K/AKT, and MAPK (Coutinho et al., 2023). Soy isoflavones, particularly genistein, also target these pathways, providing a complementary mechanism of action.

Additionally, curcumin has been shown to enhance the bioavailability of genistein, further increasing its therapeutic potential (Gan et al., 2018). This is particularly important in cancer treatment, where ensuring effective absorption and distribution of anticancer compounds is crucial for achieving therapeutic efficacy.

Soy Isoflavones and Green Tea Catechins

Green tea catechins, especially epigallocatechin-3-gallate (EGCG), are well-known for their antioxidant and anticancer properties. EGCG has been shown to inhibit cancer cell proliferation, induce apoptosis, and reduce metastasis (Ohishi et al., 2022). Research has explored combining soy isoflavones like genistein with EGCG to enhance the anticancer effects of both compounds (Kundur et al., 2019).

A study by Kundur et al. (2019) demonstrated that the combination of genistein and EGCG exhibited enhanced anticancer effects in breast cancer cells. The results indicated that the combination promoted apoptosis and inhibited cell proliferation more effectively than either compound alone. Both genistein and EGCG target key signaling pathways such as PI3K/AKT, which regulates cell survival and proliferation. The study highlighted the potential of combining soy isoflavones with green tea catechins for more potent anticancer activity.

EGCG also complements soy isoflavones by modulating the tumor microenvironment. EGCG has been shown to inhibit angiogenesis, the process through which tumors develop blood vessels to supply nutrients, and reduce oxidative stress (Mokra et al., 2022). When combined with genistein, EGCG may not only enhance cancer cell sensitivity to therapy but also protect normal tissues from damage during cancer treatment.

Soy Isoflavones and Resveratrol

Resveratrol, a polyphenolic compound found in grapes and red wine, has garnered attention for its anticancer properties (Kursvietiene et al., 2023). It has been shown to inhibit cancer cell proliferation, promote apoptosis, and reduce inflammation. When combined with soy isoflavones, resveratrol may provide a complementary mechanism of action, as both compounds target similar signaling pathways involved in cancer progression.

Research by Tuli et al. (2019) examined the effects of combining genistein and resveratrol in prostate cancer cells. The combination of these two compounds resulted in significant inhibition of cell proliferation and induction of apoptosis. The study suggested that the synergy between genistein and resveratrol was due to their ability to modulate key pathways such as PI3K/AKT and MAPK, which are often dysregulated in cancer cells. Resveratrol also plays a role in reducing inflammation and oxidative stress, which are common in cancer and can contribute to tumor progression (Aggarwal et al., 2019). By combining resveratrol with soy isoflavones like genistein, it is possible to target not only cancer cells but also the tumor microenvironment, further enhancing the therapeutic effect.

Soy Isoflavones and Cruciferous Vegetables

Cruciferous vegetables, such as broccoli, cabbage, and kale, contain compounds like sulforaphane, which have well-established anticancer properties. Sulforaphane has been shown to inhibit cancer cell growth, promote apoptosis, and reduce inflammation through the modulation of various signaling pathways, including the Nrf2 pathway (Sharma, Tollefsbol, 2022). Research has explored combining soy isoflavones with sulforaphane to enhance the anticancer effects of both compounds.

A study by Sharma and Tollefsbol (2022) investigated the combined effects of genistein and sulforaphane in prostate cancer cells. The results showed that the combination of genistein and sulforaphane led to a significant reduction in cell proliferation and an increase in apoptosis. The synergistic effect was attributed to the activation of Nrf2, which enhances antioxidant activity and reduces oxidative stress in cancer cells. By combining genistein with sulforaphane, it may be possible to target multiple pathways involved in tumorigenesis, improving the overall therapeutic effect. Moreover, sulforaphane has been shown to modulate the immune response and inhibit tumor angiogenesis (Mahn, Castillo, 2021). This makes it an ideal partner for soy isoflavones, which also have immunomodulatory properties. Together, they provide a comprehensive approach to cancer treatment, targeting both cancer cells and the tumor microenvironment.

Recommendations for Soy Consumption

Current recommendations suggest that incorporating soy foods into the diet may provide a variety of health benefits, including potential cancer prevention. Soy foods, such as tofu, tempeh, edamame, and soy milk, are rich in isoflavones, which exhibit antioxidant, anti-inflammatory, and anticancer properties. Health organizations such as the American Institute for Cancer Research (AICR) and the World Cancer Research Fund (WCRF) generally encourage the consumption of plant-based foods, including soy, as part of a diet that emphasizes fruits, vegetables, whole grains, and legumes. Soy foods are considered safe for most people when consumed in moderate amounts, and they may offer a nutritional alternative to animal-based products.

Incorporating soy as a part of a balanced diet, particularly in populations at higher risk for certain cancers, such as breast, prostate, and colorectal cancer, may help to lower the incidence of these cancers. Soy isoflavones are thought to exert their protective effects by interacting with estrogen receptors, modulating cell signaling pathways, and exhibiting antioxidant properties. These mechanisms make soy a promising dietary component for cancer prevention. However, it is important to note that the effects of soy may vary depending on individual factors, including health conditions and lifestyle choices.

While the general population may benefit from including soy in their diet, it is essential for individuals with specific health concerns, such as thyroid disorders or hormone-sensitive cancers, to consult with a healthcare provider before making significant dietary changes. The interaction between soy isoflavones and estrogen receptors, for example, has raised concerns for individuals with estrogen-sensitive conditions, though the overall evidence is still inconclusive. Therefore, personalized dietary recommendations that take into account individual health factors are necessary.

3. Conclusion

The integration of soybeans into the diet holds promise for cancer prevention and management, largely due to the bioactive isoflavones found in soy, which exhibit antioxidant, anti-inflammatory, and anticancer properties. Epidemiological and clinical studies provide supportive evidence for the health benefits of soy, particularly in reducing the risk of hormone-related cancers such as breast and prostate cancer. However, the mechanisms through which soy isoflavones exert their anticancer effects are not fully understood, and more research is needed to clarify these processes. Additionally, while moderate soy consumption is generally considered safe, the long-term safety of high-dose isoflavone supplementation remains uncertain, and further investigation is warranted.

Ultimately, incorporating soy foods into a balanced diet can be a beneficial strategy for cancer prevention and management. However, it is essential to consider individual variability in isoflavone metabolism, the potential risks of high-dose supplementation, and the need for personalized dietary recommendations. As research progresses, a more comprehensive understanding of the role of soy in cancer prevention and treatment will help to inform dietary guidelines and therapeutic approaches for cancer patients.

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Behind the Facade: Unmasking the Hidden Threat of Dyslipidemia Among Healthy Looking Students

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Abstract

Dyslipidemia is a significant risk factor for cardiovascular disease (CVD), and its prevalence is increasing globally. This study aimed to investigate the prevalence of dyslipidemia and its associated risk factors among apparently healthy students in the Department of Science Laboratory Technology, Bauchi State University Gadau. A total of 200 students (137 males and 63 females) aged 18-42 years participated in the study. Anthropometric measurements, including body mass index (BMI), and lipid profile parameters, including total cholesterol (TC), triglycerides (TG), high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C), were assessed. The results showed a high prevalence of dyslipidemia (52.0 %) among the students, with abnormal lipid profiles observed in 18.2 % for TC, 9.3 % for TG, 19.8 % for HDL-C, and 3.3 % for LDL-C. The study also found no significant difference in the mean values of TC, TG, HDL-C, and LDL-C between males and females. However, a significant difference was observed in the mean age of participants when compared across underweight, normal weight, and overweight categories. The study highlights the need for regular assessment of lipid profiles and promotion of healthy lifestyle habits among students to prevent and control CVD. The findings of this study can inform the development of targeted interventions to reduce the burden of dyslipidemia and CVD among young adults.

Keywords: dyslipidemia, prevalence, apparently healthy students, lipid profile, cardiovascular disease risk factors, body mass index, lifestyle habits.

1. Background of the study

Dyslipidemia, defined by abnormal amounts of lipids in the blood including triglycerides (Kosmas et al., 2023), cholesterol, and phospholipids, remains a serious worldwide health issue. The disorder comprises a spectrum of lipid abnormalities, such as hypercholesterolemia, hypertriglyceridemia, and mixed dyslipidemia, which may come from both hereditary and environmental causes (Pirillo et al., 2021). In industrialized nations, the major type of dyslipidemia is hyperlipidemia, typically related to high-calorie diets rich in saturated fats and trans fats, sedentary lifestyles, and other modifiable risk factors (Al-Worafi, 2024).

Dyslipidemia is a key modifiable risk factor for ischemic heart disease (IHD), the main cause of morbidity and death globally. Elevated levels of triglycerides (TG), total cholesterol (TC), and low-density lipoprotein cholesterol (LDL-C), along with low levels of high-density lipoprotein

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cholesterol (HDL-C), contribute to the pathogenesis of atherosclerosis, a process involving lipid deposition, endothelial dysfunction, and inflammation (Georgoulis et al., 2022; Kosmas et al., 2023). The presence of dyslipidemia has been demonstrated to accelerate the formation of atherosclerotic plaques, increasing the risk of myocardial infarction, stroke, and other cardiovascular events (Brunham et al., 2024). According to the World Health Organization (WHO), dyslipidemia is responsible for around 15 % of ischemic heart disease and stroke cases, contributing to over four million deaths yearly (Yuyun et al., 2020).

The worldwide burden of cardiovascular disease (CVD) highlights the urgency of managing dyslipidemia. In 2012, CVD contributed to 17.5 million fatalities, with dyslipidemia cited as one of the primary factors to this frightening number (Pirillo et al., 2021). Epidemiological studies suggest a constant, graded association between total plasma cholesterol concentrations and coronary risk, especially in younger persons (Liu et al., 2023). While lifestyle variables, such as food and physical exercise, account for 80 % of lipid abnormalities, hereditary illnesses such as familial hypercholesterolemia contribute to the remaining 20 % (Ogura et al., 2018). Understanding the relationship between these elements is critical for establishing effective preventative and treatment measures.

While dyslipidemia has generally been linked with industrialized nations, its incidence is growing in underdeveloped countries due to urbanization and the adoption of Western food and lifestyle practices. This epidemiological shift has led to an increasing burden of CVD in areas that formerly had lower rates of dyslipidemia and associated disorders (Mbogori, Mucherah, 2019; Qureshi et al., 2021). Addressing this problem requires extensive public health initiatives, including awareness campaigns, regular lipid monitoring, and lifestyle adjustments customized to varied groups.

Despite rising awareness of dyslipidemia, research on its incidence and risk factors in particular subpopulations remains restricted (Gebreegziabiher et al., 2021). For instance, statistics on university students, a population at a vital stage of establishing lifetime health practices, are rare. This group typically undergoes major lifestyle changes, such as changing food habits, reduced physical activity, and higher stress levels, which might predispose them to dyslipidemia (Banna et al., 2022; Moossavi, Bishehsari, 2019). Understanding the lipid profiles and related variables among students is vital for directing focused actions.

This research intends to address the information gap by examining lipid profiles and related variables among apparently healthy students in the Department of Science Laboratory Technology at Bauchi State University, Gadau. By studying the frequency and determinants of dyslipidemia in this community, the findings may influence preventative interventions and enhance cardiovascular health in comparable demographic groups. Such initiatives are crucial for decreasing the long-term burden of CVD and improving overall public health outcomes.

2. Materials and Methods

Study Area

This study was conducted at the Faculty of Science, Department of Science Laboratory Technology, Bauchi State University Gadau, located in Gadau town, Bauchi State, North East Nigeria.

Study Subjects

A random sampling technique was used to recruit 200 apparently healthy students from the Department of Science Laboratory Technology. Informed consent was obtained from each participant prior to the study.

Inclusion and Exclusion Criteria

Apparently healthy students in the Department of Science Laboratory Technology were included, while non-healthy students were excluded.

Ethical Clearance

Ethical clearance was obtained from the Research and Ethical Clearance Committee of Bauchi State University Gadau, in accordance with the World Association Declaration of Helsinki's Ethical Principles for Medical Research Involving Human Subjects.

Anthropometric Measurements

Height, weight, and body mass index (BMI) were measured. Height was measured using a calibrated pole, while weight was measured using a measuring scale. BMI was calculated as weight (kg) divided by height (m) squared according to techniques as described by Molepo (2018).

Statistical Analysis

Data were analyzed using SPSS version 20.0. The level of significance was set at $p < 0.05$.

Sample Collection

Blood samples were collected from participants after an overnight fast of 10–12 hours. Five milliliters (5 ml) of blood were collected from the cubital superficial vein by venepuncture.

Estimation of Total Cholesterol

Serum total cholesterol was determined using an enzymatic reaction as described by Meiattini et al. (1978).

Estimation of Serum Triglyceride

Serum triglyceride was determined using an enzymatic calorimetric method as described by Saleem et al. (2016).

Estimation of High-Density Lipoprotein Cholesterol (HDL-C)

Serum HDL-C was determined using the Groove method as described by Ogura et al. (2018).

Estimation of Low-Density Lipoprotein Cholesterol (LDL-C)

Serum LDL-C was calculated using the Friedewald formula as described by Hong et al. (2023).

3. Results

This study investigated the lipid profile and prevalence of dyslipidemia among apparently healthy students in the Department of Science Laboratory Technology. A total of 200 students participated in the study.

Demographic Characteristics

The majority of participants were male (68.5 %), with a mean age of 26.00 ± 5.09 years. The age distribution ranged from 18–42 years, with 38 % of participants falling within the 23–27 age range. The body mass index (BMI) classification revealed that 52 % of participants were overweight, 44 % had a normal weight, and 4 % were underweight (Table 1).

Table 1. Sex and Age Distribution and Body Mass Index (BMI) of Apparently Healthy Students in Department of Science Laboratory Technology

Variable	Number of participants (N)	Percentage(%)
Sex		
Male	137	68.5
Female	68	31.5
Total	**200**	**100.0**
Age group (years)		
18-22	58	29.0
23-27	76	38.0
28-32	43	21.5
33-37	16	8.0
38-42	7	3.5
Total	**200**	**100.0**
BMI (Kg/m²)		
Under weight ≤18.4	8	4.0
Normal weight 18.5-24.9	88	44.0
Overweight ≥25.0	104	52.0
Total	**200**	**100.0**

Lipid Profile

The mean values for total cholesterol (TC), triglycerides (TG), high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C) were 4.36 ± 1.01 mmol/L, 1.16 ± 0.44 mmol/L, 1.30 ± 0.28 mmol/L, and 2.53 ± 0.95 mmol/L, respectively (Table 2).

Table 2. Mean ± Standard deviation of BMI and lipid profile parameters of Apparently Healthy Students in Department of Science Laboratory Technology

Variable	Study Subjects
	Mean ± SD
Body Mass Index (Kg/m^2)	26.00 ± 5.09
Total cholesterol (mmol/L)	4.36 ± 1.01
Triglyceride (mmol/L)	1.16 ± 0.44
HDL-Cholesterol (mmol/L)	1.30 ± 0.28
LDL-Cholesterol (mmol/L)	2.53 ± 0.95

Notes: Mean ± SD

Comparison of Lipid Profile Parameters

No significant differences were observed in the mean values of TC, TG, HDL-C, and LDL-C between males and females. However, the mean age was significantly higher in males than in females (Table 3).

Table 3. Comparison of mean BMI and Lipid Profile of Male and Female Apparently Healthy Students in the Department of Science Laboratory Technology

Variable	Male (Mean ± SD)	Female (Mean ± SD)	p-value	Remark
Age (years)	26.45 ± 5.53	25.00 ± 3.80	0.01	S
Body Mass Index (Kg/m2)	25.73 ± 5.03	26.18 ± 4.31	0.39	NS
Total cholesterol (mmol/L)	4.40 ± 1.01	4.29 ± 1.01	0.35	NS
Triglyceride (mmol/L)	1.19 ± 0.47	1.10 ± 0.37	0.07	NS
HDL-Cholesterol (mmol/L)	1.31 ± 0.29	1.27 ± 0.26	0.23	NS
LDL-Cholesterol(mmol/L)	2.54±0.98	2.51±0.90	0.81	NS

Notes: Mean ± SD

Comparison of Lipid Profile Parameters Based on BMI

A significant difference was observed in the mean age of participants when compared across underweight, normal weight, and overweight categories. However, no significant differences were observed in the mean values of TC, TG, HDL-C, and LDL-C across these BMI categories ($p < 0.01$). (Table 4).

Table 4. Comparison of Lipid profile parameters based on Body mass index of Apparently Healthy Students in Department of Science Laboratory Technology

Variable	Under weight (≤18.4Kg/m^2)	Normal weight (18.5-24.9Kg/m^2)	Over weight (≥25.0Kg/m^2)	p-value	Remarks
	(Mean ± SD)	(Mean ± SD)	(Mean ± SD)		
Age (years)	24.44 ± 4.29	25.19 ± 4.34	26.79 ± 5.60	0.001	S
Total cholesterol(mmol/L)	4.68 ± 0.86	4.41 ± 0.99	4.36 ± 1.01	0.28	NS
Triglyceride (mmol/L)	1.04 ± 0.51	1.14 ± 0.48	1.19 ± 0.40	0.35	NS
HDL-Cholesterol (mmol/L)	1.34 ± 0.29	1.29 ± 0.29	1.30 ± 0.27	0.77	NS
LDL-Cholesterol (mmol/L)	2.85 ± 0.94	2.58 ± 0.92	2.47 ± 0.97	0.20	NS

Notes: Mean ± SD

Correlation Analysis

No significant correlations were observed between BMI and lipid profile parameters (TC, TG, HDL-C, and LDL-C) ($p < 0.01$) (Table 5).

Table 5. Pearson Correlation Coefficient (r) of BMI and lipid profile parameters

Variable	Pearson Correlation Coefficient (r)	p-value	Remark
	R		
BMI and TC	-0.035	0.484	NS
BMI and TG	0.088	0.078	NS
BMI and HDL	0.036	0.473	NS
BMI and LDL	-0.060	0.232	NS

Foot note: The correlation is considered to be significant at $P \leq 0.05$ level(2-tailed). S = Statistically Significant while NS = Not Statistically Significant

Prevalence of Dyslipidemia

The overall prevalence of dyslipidemia was 52 % (104/200). The prevalence of abnormal lipid profiles was 18.2 % for TC, 9.3 % for TG, 19.8 % for HDL-C, and 3.3 % for LDL-C (Table 6 and Table 7).

Table 6. Prevalence of Dyslipidaemia among Apparently Healthy Students in Department of Science Laboratory Technology

Variable	NumberObserved(N)	Prevalence(%)
Dyslipidaemia		
Yes	104	52.0
No	96	48.0
Total	**200**	**100.0**

Table 7. The percentage prevalence of abnormal TC, TG, HDL & LDL among apparently Healthy Student of Science Laboratory Technology

Biochemical Parameters	Percentage (%) (Abnormal)
Total Cholesterol (2.2-5.2) mmol/l	18.2 %
Triglyceride (≤1.7) mmol/l	9.3 %
HDL (1.1-1.5) mmol/l	19.8 %
LDL (≤3.9) mmol/l	3.3 %

4. Discussion

This research examined the frequency of dyslipidemia among ostensibly healthy students in the Department of Science Laboratory Technology at Bauchi State University Gadau. Dyslipidemia is a major risk factor for cardiovascular diseases (CVD), accounting for 13 % of worldwide instances of ischemic heart disease (IHD) and stroke (Yuyun et al., 2020). Given that almost 80 % of lipid problems are associated with food and lifestyle, comprehending regional patterns and risk factors is essential for timely management (Kenneth, 2024).

The prevalence of dyslipidemia in this research was 52.0 %, with mean values for BMI, total cholesterol (TC), triglycerides (TG), HDL-cholesterol, and LDL-cholesterol recorded at 26.00 ± 5.09 kg/m², 4.36 ± 1.01 mmol/L, 1.16 ± 0.44 mmol/L, 1.30 ± 0.28 mmol/L, and 2.53 ± 0.95 mmol/L, respectively. The significant incidence raises concerns about long-term cardiovascular risks in young people and necessitates aggressive public health interventions.

The global incidence of dyslipidemia varies markedly depending on lifestyle, dietary habits, socioeconomic variables, and access to healthcare. A research conducted in China among university students indicated a much lower frequency of 13.17 % (Liu et al., 2023). This gap may be ascribed to the dietary practices in China, characterized by a high intake of vegetables and lean meats, which mitigates the risk of lipid abnormalities. In contrast, research in industrialized nations on

dyslipidemia like the United States reveals greater prevalence rates (Aggarwal et al., 2023). Data from the National Health and Nutrition Examination Survey (NHANES) suggest that roughly 20 % of adults aged 20–34 years display at least one kind of dyslipidemia (Chen et al., 2023). This increased prevalence is connected with sedentary lifestyles and the widespread use of processed, calorie-dense foods, exhibiting trends comparable to those in the present research sample.

In Africa, urbanization and the adoption of Westernized diets have contributed to an increasing trend in dyslipidemia prevalence (Mbogori, Mucherah, 2019). A research in Ethiopia indicated a frequency of 67 % among university students, surpassing the 52.0 % seen in this survey (Gebreegziabiher et al., 2021). The Ethiopian research emphasized excessive carbohydrate and fat diet combined with low physical exercise as important causes.

A prevalence of 41.1 % was observed among young people in Ghana, somewhat lower than the present research (Blankson et al., 2022). This disparity may be linked to variances in eating habits and urbanization levels. Many African nations, including Nigeria, are experiencing a dietary shift marked by increasing consumption of energy-dense, processed foods, worsening the dyslipidemia load (Afolabi, Holdbrooke, 2024). Dyslipidemia prevalence among young adults in Nigeria has been thoroughly examined, with conclusions that accord with this study's results. A research in Southwest Nigeria revealed a frequency of 56.8 % among university students (Durowade et al., 2021). The somewhat greater incidence may reflect regional variations in eating patterns and degrees of urbanization. Similarly, a research done in Northern Nigeria found a frequency of 46.5 % among teenagers (Gebreegziabiher et al., 2021). While lower than the 52.0 % identified in this research, it shows the rising public health issue across various age groups in Nigeria.

The mean BMI in this research (26.00 ± 5.09 kg/m²) reveals a general tendency toward overweight and obesity, with 52.0 % of individuals categorized as overweight. This conclusion is similar with previous Nigerian research, such as Ahmed et al. (2019) and Banna et al. (2022), where overweight and obesity were frequent among university students. Overweight and obesity contribute to dyslipidemia by encouraging lipid metabolism dysregulation, increasing cardiovascular risk (Vekic et al., 2023).

The lipid profile characteristics in this research were comparable to those reported in similar African environments. The mean TC (4.36 ± 1.01 mmol/L) and HDL-C (1.30 ± 0.28 mmol/L) accord with data from Ghana (Blankson et al., 2022) but are somewhat higher than those reported in Ethiopia (Gebreegziabiher et al., 2021). These disparities underscore the importance of food and lifestyle variables distinct to each location.

Interestingly, no significant variations in lipid profile characteristics were identified between males and females, consistent with the results of Hussain et al. (2019) in Pakistan. This shows that gender may not have a substantial effect in dyslipidemia prevalence among younger populations, whereas hormonal and metabolic variations could alter lipid profiles in later age groups.

The significant incidence of dyslipidemia in this research underscores the urgent need for focused therapies in academic settings. Routine lipid profile examinations, nutritional advice, and attempts to increase physical activity should be included into health programs for students. Additionally, public health initiatives stressing the hazards of dyslipidemia and promoting good eating habits might play a significant role in lowering the incidence of cardiovascular illnesses in Nigeria.

5. Conclusion

In conclusion, this study highlights a high prevalence rate of dyslipidemia (52.0 %) among apparently healthy students in the Department of Science Laboratory Technology. The findings emphasize the need for regular assessment of lipid profiles and promotion of healthy lifestyle habits among students.

6. Recommendations

Further studies are recommended to investigate the prevalence of dyslipidemia among a larger sample size of apparently healthy students in the Department of Science Laboratory Technology. Additionally, students are advised to reduce their intake of fast and processed foods to minimize the risk factors associated with dyslipidemia and promote overall health and well-being.

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The "European Journal of Medicine" (2013–2023): Thematic Index of Published Researches over the last 10 years

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Abstract

This article is a thematic index of articles in a scientific journal "European Journal of Medicine" that have been published in it over the last 10 years. The materials for this work are the studies that were published in the journal in the period from 2013 to 2023. The research methodology is presented by both general scientific and special research methods. In the article, the authors provide a thematic analysis of the works that were published in the journal "European Journal of Medicine". In conclusion, the authors note that over the ten-year period of the journal's existence, 128 articles on various areas of medical science were published in it. Separately, the authors provide data on the 5 most popular areas of published research, as well as on the language ratio of publications.

Keywords: medicine, modern medicine, medical science, medical research, medical journal, research review, intellectual capital, publication activity, work results, thematic index.

1. Introduction

In nowadays the journal "European Journal of Medicine" is an open access medical scientific journal that publishes research in various areas of medical science.

The aim of this work is to develop a thematic index of the journal "European Journal of Medicine" articles that were published between 2013 and 2023.

This article is an attempt by the author to summarize the publication activity of the journal "European Journal of Medicine" and its authors over the last 10 years (2013–2023).

2. Materials and methods

The research methodology is based on general scientific and special research methods. General scientific research methods are represented by: analysis, synthesis, induction, deduction. Special research methods are represented by: content analysis (to analyze the content of studies that were published in the journal), bibliographic method (in terms of selection, classification and ranking of studies that were published in the journal), and narrative method (to form the narrative line of this paper).

The materials for the thematic index were studies that were published in the journal "European Journal of Medicine" in the period from 2013 to 2023.

3. Discussion

The journal was founded in 2013 and is still being published. From 2013 to 2021, the "European Journal of Medicine" was published twice a year. From 2022 to the present, the "European Journal of Medicine" is published once a year (in December) (Figure 1).

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The mission of the journal is the formation of information space aimed at enhancing the professional competence of health professionals, as well as in the introduction of innovations and advanced treatment methods in medical practice.

The journal's objective is to familiarize the specialists and all interested readers with the contemporary achievements in the field of medical science. The importance is also given to the process of raising the level of postgraduate education and quality of medical care to the population.

Fig. 1. Cover of the medical scientific journal "European Journal of Medicine".

Nowadays review articles that are devoted to various aspects of the analysis of published studies (Amobonye et al., 2024; Mamadaliev, 2023; Mamadaliev, 2023a) or the publication activity of journals are quite common in modern science. This type of scientific work is not only purely review in nature for the formation of certain conclusions, but also helps new (often young) researchers to better navigate the area of scientific interests, increasing their research potential (Shtuts et al., 2023).

Thus, this thematic index is of an overview and at the same time introductory nature; it will also be useful not only for potential authors of the journal and researchers, but also for a wide range of readers who are interested in current research in the field of medicine.

4. Results

Medical researches.

Phylogenetically Theory of General Pathology. Nutritive Disturbance Is the Basis of Metabolic Syndrome Pathogenesis, Overeating Syndrome. Leptin and Adiponectin Role was presented in the article of Vladimir N. Titov (Titov, 2013).

The Role of SPINK1 Gene Mutation in Chronic Pancreatitis Development and Progression was presented in the article of Yurii A. Kucheryavyi, Zalina F. Tibilova, Dmitrii N. Andreev, Andrei V. Smirnov and Igor' V. Maev (Kucheryavyi et al., 2013).

Aspects of Medical and Psychological Rehabilitation of Patients after Aesthetic Breast Surgery was presented in the article of Kirill V. Gordon and Eduard S. Khudoev (Gordon, Khudoev, 2013).

Results of the Study of Medical and Biological Properties of Modern Dental Polymers was presented in the article of Irina P. Ryzhova, Andrey A. Prisnyi and Mariya S. Salivonchik (Ryzhova et al., 2013).

Natural and Preformed Physical Factors in Phase Medical Rehabilitation of Patients with Pubertal Menorrhagia was presented in the article of Kirill V. Gordon and Victoria A. Krutova (Gordon, Krutova, 2013).

Importance of Climatic and Balneological Resources of Kuban Healing Areas for Enhancement of Gynecological Patients in Puberty Age was presented in the article of Anatolii T. Bykov and Victoria A. Krutova (Bykov, Krutova, 2013).

Staged Physiotherapy in Postoperative Rehabilitation of Patients with Symptomatic Dyshormonal Breast Diseases was presented in the article of Anatoly T. Bykov, Eduard S. Khudoev and Kirill V. Gordon (Bykov et al., 2013).

Syndrom-Pathogen Effect of Ozone Therapy and Nauheim Baths on Patients with Cardiovascular Disease was presented in the article ofElena I. Sycheva and Antonina V. Polyakova (Sycheva, Polyakova, 2014).

Peculiarities of Polymorphism in Glutathione S-transferase Genes in Newborns From Different Ecological Zones of Ivano-Frankivsk region was presented in the article of Natalia H. Horovenko, Svitlana V. Podolska and Zoryana R. Kocherha (Horovenko et al., 2014).

Assessment of the Impact of Some Inhibitors of Angiotensin-converting Ferment, Omeprazole and Their Combinations on the Frequency of Erosive Ulcerous Disorders of Gastric Mucosa When Administered with Indometacin was presented in the article of Shakhnoza E. Usmanova, Abdujalol V. Yakubov and Abror A. Khamraev (Usmanova et al., 2014).

Age Futures of Wound Treatment With Chitosan Films Application was presented in the article of Alexandr N. Oleshko (Oleshko, 2014).

Morphological Estimation of Bone Tissue in Peri-implant Zone if Using Dental Implants of Different Composition was presented in the article of Oleh N. Mishenko, Ivan N. Babich, Natalia V. Zaytceva and Maxim V. Pogorielov (Mishenko et al., 2014).

Clustering of the Parameters of Rhythmographic Analysis of Man's Electrocardiogram was presented in the article of Ekaterina A. Filippova, Alexander V. Korobeynikov and Denis V. Lozhkarev (Filippova et al., 2014).

Growth and Microhardness of the Rat's Tibia in Different Ages after Fracture Modeling was presented in the article of Andrii N. Bushtruk (Bushtruk, 2014).

Possibilities of Application of the Method of Biological Feedback in Resort Treatment of Patients with Cerebrovascular Diseases was presented in the article of Aleksandr N. Bitsadze (Bitsadze, 2014).

Chitosan Membrane as a New Wound Healing Agent on Chemical Wound Model was presented in the article of Yuliya A. Tkachenko (Tkachenko, 2014).

Inverting Notions of the Biological Role of the Renin → Angiotensin-II → Aldosterone System and the Function of Arterial Pressure as a Metabolism Regulator was presented in the article of Vladimir N. Titov (Titov, 2014).

Indices of Exhaled Breath Condensate in Children With Bronchial Asthma Under the Deletion Polymorphism of Genes GSTT1 and GSTM1 was presented in the article of Olena C. Koloskova, Tetiana M. Bilous and Lyudmyla V. Mikaluk (Koloskova et al., 2014a).

The Control Level of Bronchial Asthma in Dependence of Genotype by BCL1 Polymorphism of Glucocorticoids Receptor Gene and Body Mass Index was presented in the article of Vladyslava V. Kmyta, Viktor F. Orlovskyi and Lyudmyla N. Prystupa (Kmyta et al., 2014).

Genetic Factors of Fibrinolysis Violation and the Role of Inhibitor Plasminogen Activator Genes Polymorphism in the Development of Secondary Thrombus Bleeding Complications in Patients With Brain Injury was presented in the article of Oleksii P. Kmyta (Kmyta, 2014).

Utility of Combination of Diagnostic Tests in Early Detection of Prostate Tumors in West Algerian Hospital was presented in the article of Abdelkrim Berroukche, Malika Bendahmane-Salmi and Abdelkrim Badreddine Kandouci (Berroukche et al., 2014).

Changes in the State of Neuromuscular System in Vertebrogenic Pathology of the Lumbar Spine of People Engaged in Mining Industry depending on the Length of Employment Service was presented in the article of Sharbanu Battakova, Uken Amanbekov, Gulraikhan Miyanova and Kanat I. Sadykov (Battakova et al., 2014a).

Management Activities on the Reduction of Ecological-related Diseases of the Nervous System of Population in Ust-Kamenogorsk was presented in the article of Sharbanu Battakova, Uken Amanbekov, Gulraikhan Miyanova and Mangaz-Dana Fazylova (Battakova et al., 2014).

The Lipid Profile among Patients with Myocardial Infarction Depending on Allelic State of the Genes ACE (I / D) and ENOS (T894G) was presented in the article of Larysa P. Sydorchuk and Julia V. Ursuliak (Sydorchuk, Ursuliak, 2014).

Highly Active Antiviral Therapy among Patients with HIV Infections was presented in the article of Nazgul Y. Sarsekeyeva and Bahyt N. Kosherova (Sarsekeyeva, Kosherova, 2014).

The State of a Cell in Systematic Immunity in Case of Injuries was presented in the article of Igor M. Plehutsa, Ruslan I. Sydorchuk and Aleksandr M. Plehutsa (Plehutsa et al., 2014).

Result of the Research Study for Treatments Against Gingivitis was presented in the article of Nana K. Natsvlishvili and Maradi A. Burduli (Natsvlishvili, Burduli, 2014).

Identification of Correlation Dependence of Risk Factors for Cardiovascular Disease Among Women at a Late Reproductive Age with Cardiovascular Pathology was presented in the article of Azha Kh. Gaidarova, Natal'ya V. Kotenko and Tat'yana A. Knyazeva (Gaidarova et al., 2014).

Evaluation of the Efficacy of Different Fungicide for the Management of Alternaria Leaf Spot Disease of Chilli was presented in the article of Manoj Kumar Yadav, Swati Tyagi, Shaily Javeria, Raveesh Kumar Gangwar and Ramesh Singh (Yadav et al., 2015).

Changes in Peripheral Hemodynamics and Clinical Symptoms in Patients With Arterial Hypertension and Abdominal Obesity Under the Influence of Treatment, Depending on Genes' Polymorphism was presented in the article of Alina Sokolenko, Larysa Sydorchuk and Maxim Sokolenko (Sokolenko et al., 2015).

Opportunistic Diseases in Hiv-Infected Patients was presented in the article of Nazgul Y. Sarsekeyeva (Sarsekeyeva, 2015).

The Canges of Burned Wounds Microbiocenosis Under Intratissue Electrophoresis of Antibacterial Remedies was presented in the article of Bogdan V. Petriuk, Ruslan I. Sydorchuk, Oleh Y. Khomko, Larysa P. Sydorchuk, Tatiyana A. Petriuk and Bogdan O. Khomko (Petriuk et al., 2015).

Indicators of Empathy Display among Future Physiotherapists was presented in the article of Romualdas K. Malinauskas and Vilija A. Malinauskiene (Malinauskas, Malinauskiene, 2015).

Influence of Environmental Factors on Population Health: Regional Approach for the Medical-Ecological Analysis (for Example, the Sumy Region of Ukraine) was presented in the article of Anatolii O. Kornus, Olesya H. Kornus and Volodymyr D. Shyschuk (Kornus et al., 2015).

Research Influence Biological Active Agents in the Course of Regulation of Functional Activity of Platelets and System of a Haemostasis was presented in the article of Nozim N. Khoshimov, Nasirov E. Kabil and Kamila A. Eshbakova (Khoshimov et al., 2015a).

Evaluation of Possible Methods and Approaches for Registering of Non-Ionizing Radiation Emitted from the Human Body was presented in the article of Ignat Ignatov, Oleg Mosin, Hugo Niggli, Christos Drossinakis and Georg Tyminski (Ignatov et al., 2015).

A Case Series: Outcome of Endoscopic Electrocautery in the Management of Branchial Fistula was presented in the article of Goh Bee See and Nurfarissa binti Hussin (See, Hussin, 2015).

The Inotropic Effects of 3'4'-Dimetyl Quercetin in Isolated Rat Papillary Muscle was presented in the article of Shunkor Khushmatov, Kamila Eshbakova and Diloram Alimova (Khushmatov et al., 2015).

Comparison of Hemostatic and Neuro Protector Properties of Alkaloids N-Metiltsitizin and a Desoxypeganin in the Conditions of in Vitro was presented in the article of Nozim N. Khoshimov, Guli M. Raimova, Kabil E. Nasirov and Valentina I. Vinogradova (Khoshimov et al., 2015).

Upper Lid Coloboma – a Case Report, was presented in the article of Chaha Kato and Ajike S Olusegun (Kato, Olusegun, 2015).

A Study of Psychosocial Risk Status and Knowledge of Reproductive Health in Adolescents in Raipur City was presented in the article of Sribas Goswami and Manjari Sahai (Goswami, Sahai, 2015).

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The Concept of Preparing Female Students for Pregnancy Management was presented in the article of Dina Venskovich (Venskovich, 2020).

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Modern Trends in Mental Health Delivery Services Worldwide and in the Russian Federation was presented in the article of Isaak Ya. Gurovich and Oleg O. Papsuev (Gurovich, Papsuev, 2013).

Medical Cluster of Olympic Legacy: Prospects and Possibilities of Use was presented in the article of Anatolij T. Bykov and Kirill V. Gordon (Bykov, Gordon, 2013).

Current Problems of Food Safety in Terms of Russia Membership in World Trade Organization was presented in the article of Galina D. Bryukhanova and Andrey A. Schetkin (Bryukhanova, Schetkin, 2013).

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Aikido Game Activities as Stimulation Factor for a Proper Behavior in Conflict Situations was presented in the article of Todor Marinov, Nezabravka Gencheva, Mariana Angelcheva, Ignat Ignatov, Diana Stefanova and Yuliana Pesheva (Marinov et al., 2018).

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Data on most popular research thematics and languages of publications.

The most popular research thematics published in the journal "European Journal of Medicine" are presented in Table 1.

Table 1. Data on most popular research thematics

№	Thematics	Number of articles
1.	Researches on Covid-19	5
2.	Research on Cancer	7
3.	Research on Diabetes	8
4.	Pregnancy and Children's medicine	19
5.	Some reviews	8

Data on the languages of publications in the journal are presented in Table 2.

Table 2. Data on languages of publications

№	Languages	Number of articles	Percentage of all publications
1.	English	85	66 %
2.	Russian	43	34 %
3.	Number of all publications: 128.		

Thus, having publications in two languages at its disposal, the journal "European Journal of Medicine" solves the important task of expanding the base of potential readers. The English language is focused on presenting research results at the global level, and the Russian language is focused on presenting research results at the level of the post-Soviet space, since the dominance of the Russian language here is still great.

5. Conclusion

Thus, over the last 10 years of the journal's existence, 128 scientific articles have been published. The topics of the published studies are very diverse, and the most popular topics of the works were: Pregnancy and Children's medicine (19 articles), Some reviews (8 articles), Research on Diabetes (8 articles), Research on Cancer (7 articles) and Researches on Covid-19 (5 articles).

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