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**EDITORIAL**

**EDITORIAL**



EDITORIAL



## The Legitimacy of Artificial Intelligence and the Role of ChatBots in Scientific Publications



### Authors' Contribution:

- A – Study design;
- B – Data collection;
- C – Statistical analysis;
- D – Data interpretation;
- E – Manuscript preparation;
- F – Literature search;
- G – Funds collection

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### Background and Aim of Study:

#### Abstract

Developing and using ChatBots based on artificial intelligence (AI) has raised issues about their legitimacy in scientific research. Authors have increasingly begun to use AI tools, but their role in scientific publications remains unrecognized. In addition, there are still no accepted norms for the use of ChatBots, and there are no rules for how to cite them when writing a scientific paper.

The aim of the study: to consider the main issues related to the use of AI that arise for authors and publishers when preparing scientific publications for publication; to develop a basic logo that reflects the role and level of involvement of the AI and the specific ChatBots in a particular study.

### Results:

We offer the essence of the definition “Human-AI System”. This plays an important role in the structure of scientific research in the study of this new phenomenon. In exploring the legitimacy of using AI-based ChatBots in scientific research, we offer a method for indicating AI involvement and the role of ChatBots in a scientific publication. A specially developed base logo is visually easy to perceive and can be used to indicate ChatBots' involvement and contributions to the paper for publication.

### Conclusions:

The existing positive aspects of using ChatBots, which greatly simplify the process of preparing and writing scientific publications, may far outweigh the small inaccuracies they may allow. In this Editorial, we invite authors and publishers to discuss the issue of the legitimacy we give to AI, and the need to define the role and contribution that ChatBots can make to scientific publication.

### Keywords:

ChatBot, artificial intelligence, Human-AI System, legitimacy, logo, scientific publication

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### Dear Authors and Publishers,

This paper was not written by a ChatBot and is intended for humans. It is likely that in the near future there will be a need to introduce such alerts for scientific publications. We are now seeing an increasing trend of using ChatBots based on artificial intelligence (AI) in scientific research and writing. It is no secret that machine-readable texts today are more demanding and more readable. We live in a time when machines write texts that are read by machines far more often than by humans.

Several companies have announced the development of AI-based ChatBots: OpenAI's ChatGPT, Google's Bard, Microsoft's Bing (a search engine with a ChatBot), etc. There are already many AI tools with different specializations for text, photos, videos, etc. AI tools are developing at an unimaginably fast pace.

Figure 1 shows the AI tools available to users for writing text.

**Figure 1**  
*AI Tools for Writing Text*



*Note.* The logos shown in the figure are taken from public sources (from the official websites of the companies). They are not ranked by ratings or other indicators.

Is ChatBots an advanced search engine? Or is it a real human intellectual competitor capable of exploring, learning, improving, creating?

Discussions about the trends and replacement of humans by AI, and the possible threats associated with it, have been ongoing since the term was introduced by John McCarthy (1959) in the middle of the last century.

This type of discussion is characteristic of most innovations. Think back to the discussions about robotics. Just as in the current AI situation, people saw benefits, problems, and threats. In the AI situation, things have become even more complicated because it has a new

characteristic – learnability, as well as the use of the Large Language Model (LLM).

To answer the above question, it is necessary to consider the essence of this phenomenon. There are many aspects to this problem: from the physical level (availability and quality of servers) to the moral and ethical level (rules, norms, values, etc.).

There is no denying that AI, including ChatBots such as GPT, has enormous potential to greatly facilitate our daily lives and be an indispensable assistant in professional activities.

A number of scientists believe that AI and ChatBots are real competitors of humans in their professional activities and may replace them in many areas in the near future (Çalli & Çalli, 2022; Dans, 2019; Dimitriadou & Lanitis, 2023; Singh & Sood, 2022).

There are also often radical views that argue that the development of AI and the proliferation of ChatBots could lead to a loss of control over them and even the extinction of humanity (Farahani, 2023).

It is normal to have different points of view about new phenomena. However, one cannot ignore the personal position of those who are leading the development of these technologies and systems. They are more immersed in the problem than others, aware of the latest research, and able to anticipate trends more objectively. Their disagreement and lack of a unified view on the prospects of using AI can have ambiguous consequences. On the one hand, it generates competition, which contributes to the development of this market and to innovation. On the other hand, we cannot be completely sure that we will not lose something more important in the pursuit of profit and the desire to lead.

*The aim of the study.* To consider the main issues related to the use of AI that arise for authors and publishers when preparing scientific publications for publication; to develop a basic logo that reflects the role and level of involvement of the AI and the specific ChatBots in a particular study.

### Results and Discussion

In this paper, we will not discuss the advantages, disadvantages, and limitations for human use of AI. We will limit ourselves to considering the problem in the area of using AI for scientific research and publication. To be fair, the rivalry between AI and humans is indeed growing. In the near future, we can expect AI to increasingly displace humans from certain areas of activity, including consulting services, telemedicine, online education, journalism, IT, etc.

This problem raises a number of fundamental questions: can AI significantly influence (replace) human activity in the Human–Human System with the new Human-AI System?

This is a fundamentally new system that raises even more questions, especially how it will affect the quality of life of the individual himself.

First of all, it is necessary to describe this definition.

**Human-AI System** is a complicated dynamic complex of interactions between living and non-living matter, is an accumulation of coordinated, interdependent and interconnected informational-technological actions of human and AI, oriented to learn from the information obtained, designed to effectively perform tasks and achieve goals.

While the answers to some questions are obvious (technology and robotization have made heavy and monotonous work easier, computerization and the Internet have helped speed up information retrieval and processing), the use of AI, including ChatBots, remains uncertain. This is especially true in the intellectual sphere: scientific research, media publications, etc.

Some of the positive things about using AI and ChatBots are that they can find relevant documents, summarize text and draw conclusions from documents, make predictions, answer questions quickly, and argue for answers based on the latest scientific research.

Despite all these impressive benefits, we have some doubts about the pace and scope of AI delegation. Would not the use of AI accelerate the pace of life so much that we lose control over it? You would agree that this small factor could radically affect our lives. Therefore, the problem of AI legitimacy needs to be addressed as soon as possible.

Since scientists are (still) the leaders of innovation and the level of development of society depends on them, let us consider the role of ChatBots in scientific publications. It is in scientific publications that ideas are first expressed and then put into practice, significantly affecting human activity and life on the planet as a whole. Existing search engines and the emergence of new ChatBots, such as ChatGPT, which use language models, greatly simplify the process of preparing and writing scientific publications. They can help authors automate research workflows such as literature searching, literature review, statistical analysis, and more.

In this Editorial, we would like to introduce our idea of creating a digital platform that has the potential to legitimize and regulate the use of AI, intelligent search engines, ChatBots in scientific and practical human activities. And first of all, it should be implemented for scientific publications.

We believe that the method we have developed, indicating AI involvement and ChatBots contributions to scientific publications, can solve this problem. We offer to use a logo that is visually easy to perceive and essentially reflects the role and level of involvement of the AI and the specific ChatBots in a particular study.

We have developed a basic logo layout that can be used to indicate the use of AI-based ChatBots in a publication. The logo has a color image and a black and white image. Consider the black and white image. The basic logo layout (Figure 2) is a rectangle with rounded corners, divided into two segments by the background.

The left segment with a gray background contains a hexagonal figure with the AIC abbreviation centered on white background. The AIC abbreviation stands for AI-based Chatbot as well as Academic International Corporation, which provides this platform.

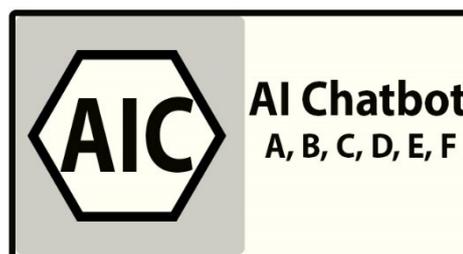
The right segment with a white background contains the "AI Chatbot" inscription. This indicates that the author(s) of the manuscript used AI-based Chatbot. Below the inscription, A, B, C, etc. letters in alphabetical order indicate this contribution to the research.

The name of the Chatbot/toolkit(s) in the Materials and Methods section; the author(s) can include the name of the Chatbot developer in the Acknowledgments section. Authors may disagree because using the logo looks like co-authoring with AI. In anticipation of this disagreement, we suggest looking at the actual capabilities of ChatBots and their role in preparing the paper. After all, ChatBots are quite capable of performing study design, data collection, statistical analysis, data interpretation, manuscript preparation, literature searches... The author only needs to specify the topic, key parameters, and manuscript design requirements, and that will be enough for ChatBot to write a review article or even an original article.

We assume that in the near future, such papers will fill publishers' email inboxes. Therefore, the dilemma of quality or quantity in scientific publications will become particularly relevant (Melnyk & Pypenko, 2021).

#### Figure 2

*Layout of a Basic Logo to Indicate the Use of AI-Based Chatbot in a Publication*



#### Note.

1. The presented logo is the authors' own creation.
2. If the author(s) used an AI-based Chatbot in the manuscript, we recommend using a contribution classification index for the manuscript.

Example of a letter designation: A – Study Design; B – Data Collection; C – Statistical Analysis; D – Data Interpretation; E – Manuscript Preparation; F – Literature Search...

Are the papers written by ChatBots the result of the intellectual activity of the author, who has skillfully set the parameters for entering information, or are they still the product of the ChatBot, which has a share in co-authorship?

Let us try to answer the question of who owns the authorship of such a publication objectively.

Despite the significant contributions that ChatBots can make, at this stage ChatBots cannot be considered legitimate authors of a scientific paper.

If only because ChatBots are not responsible for the text they write, they cannot sign a statement about the presence or absence of a conflict of interest. Such a statement is required by most scientific journals, including the International Journal of Science Annals (IJSA).



However, there is a precedent of ChatGPT having a profile in Scopus (ChatGPT, n. d.), as well as papers published by prestigious international publishers in which ChatGPT is listed as an author (O'Connor & ChatGPT, 2022).

Also noteworthy is the book "Impromptu: Amplifying Our Humanity through AI", in which GPT-4 writes: "I would like to thank Reid Hoffman for inviting me to co-author this book with him". Please note that Reid Hoffman, a leader in the field of AI, states on the title page "By Reid Hoffman with GPT-4" (Hoffman with GPT-4, 2023).

There is one case in the literature where ChatGPT has answered negatively to the question of whether it meets all of the International Committee of Medical Journal Editors (ICMJE) criteria for authorship – "ChatGPT can assist in the drafting or revising of a work, but it cannot fulfill all of the ICMJE criteria for authorship" (Anderson, 2023).

Perhaps it is a question of specific criteria for authorship, rather than ChatGPT's refusal to acknowledge its role in writing. In any case, we have not received a clear answer to this question. Therefore, the answer should be sought in the aspect of ethics, as well as the willingness of the person to recognize the authorship of ChatGPT or not.

Todd Carpenter conducted a ChatGPT survey on the impact of AI on science communication. Specifically, he asked about the ethics for an author of using AI in developing a scholarly paper. As ChatGPT learned from the response, ethics "depends on the specific context and the expectations of the research community in which the article will be published" (Carpenter, 2023).

ChatGPT itself sees no ethical problems with the use of AI in scientific writing. However, it notes that authors must "clearly state this in the article and provide appropriate credit to the AI program" (Carpenter, 2023). Springer Nature and Taylor & Francis Publishers suggest that AI contributions should be reflected in the methods or acknowledgements section, rather than being listed as an author (Stokel-Walker, 2023).

This position is justified by the important characteristic of authorship – responsibility for publication.

In this context, it should be noted that it is known that AI has convincingly described the results of studies (specifying the organizations that conducted them and the quantitative indicators). However, when clarifying the information, he could not confirm it with any sources and apologized for the error and confusion in his statement (Davis, 2023).

These facts point to the need for caution and responsible use of information obtained from AI. It is important to remember that human remains responsible and accountable for copyright infringement.

If someone claims undivided authorship, he/she should objectively, based on facts, state the role of ChatBot in the scientific publication, claim full responsibility for the content of his/her manuscript and the result, including the parts created by ChatBots, as well as the degree of originality of his/her publication. Perhaps there is no shame in stating that the research design, data collection, or statistical analysis was done using a particular

ChatBot. In doing so, the question posed to the ChatBot and the answer received from the ChatBot should be clearly stated.

In our opinion, information about the use of ChatBot should necessarily be reflected in the methodology with a correct indication of which ChatBot was used by the author, where and to what extent. The name of ChatBot and its characteristics should be specified in the References list.

Our recommendation is also based on the fact that in the near future it will probably be impossible to hide the involvement of ChatBots in the writing of a scientific paper. ChatBots-creating companies will start using something like a "watermarking" on the bot's output to make plagiarism easier to spot. The San Francisco-based company OpenAI, which created ChatGPT, has already announced this. OpenAI guest researcher Scott Aaronson said that "the technology would work by subtly tweaking the specific choice of words selected by ChatGPT, ..., in a way that wouldn't be noticeable to a reader, but would be statistically predictable to anyone looking for signs of machine-generated text" (Hern, 2022).

So there is a good chance that if you try to pretend to be the author of text written by a ChatBot, you may be detected. Turnitin has already begun work on developing an AI-based text detection tool (Chechitelli, 2023).

In early April 2023, the American Psychological Association (APA) website published information with guidelines for quoting and reproducing text generated by ChatBots (McAdoo, 2023).

We recommend that Authors of our Journal use these standards when preparing a manuscript and citing text generated by ChatBots.

It is important to note the statement of the Committee of Publication Ethics (COPE). On its website, the Committee has published its official position on authorship and the use of AI tools (COPE Council, 2021; COPE, 30 January 2023; COPE, 13 February 2023; COPE, 23 February 2023; Watson & Stiglic, 2023). Also a number of papers on using AI for scientific writing (Çalli & Çalli, 2022; Dans, 2019; Dimitriadou & Lanitis, 2023; Farahani, 2023; Singh & Sood, 2022).

Today, COPE is virtually the only organization in the scientific world that promotes ethical principles in scientific publishing. COPE Council members warn that the increasing role of AI in research writing "has significant implications for research integrity and the need for improved means and tools to detect fraudulent research" (COPE, 23 March 2023).

This is a matter of concern for those scientific publishers who conduct their activities responsibly and put into practice the principles of scientific publishing ethics and the COPE standards.

The IJSA is a full member of the COPE (COPE, n.d.).

Thanks to this, the members of the IJSA Editorial Board were able to participate online in events dedicated to the discussion of this topical issue (COPE, 23 March 2023).

## Conclusions

We started our Editorial with a warning: this paper was not written by a ChatBot and is intended for humans.



Although we don't have the slightest doubt that it will be read by AI, because this paper will be converted into multiple formats and found in several dozen scientometric databases, repositories, and search engines. It is time for humans to define the legitimacy we give to AI.

We have offered the essence of the definition "Human-AI System". This allows us to clarify the essential features of the new phenomenon under consideration, which opens prospects for its further study.

Authors should be transparent about the use of AI tools. This will allow readers to know what and how the paper was created, and it will allow reviewers, editors, and publishers to check the quality of the paper.

We encourage you to consult the recommendations of leading publishers Springer Nature and Taylor & Francis, as well as the expertise of COPE Council members on the ethics of scientific publication, and the recommendations of APA experts on citing and reproducing ChatBot-generated text.

The need to determine the legitimacy of using AI-based ChatBots in scientific research prompted us to develop a method for indicating AI involvement and the role of ChatBots in a scientific publication.

We recommend using the developed base logo to indicate ChatBots' involvement and contributions to the writing of the paper. This would be appropriate for authors, reviewers, editors, readers, and, from our point of view, ethical.

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**SOCIAL AND  
BEHAVIORAL SCIENCES**

**Education**



ORIGINAL RESEARCH



## The Effect of Self-Compassion on Academic Burnout in Undergraduate Students



### Authors' Contribution:

- A – Study design;
- B – Data collection;
- C – Statistical analysis;
- D – Data interpretation;
- E – Manuscript preparation;
- F – Literature search;
- G – Funds collection

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### Background and Aim of Study:

#### Abstract

Due to high academic demands, undergraduate students are prone to academic burnout. Academic burnout is emotional exhaustion caused by the pressures of academic tasks. Having self-compassion can be a protective factor against academic burnout. When dealing with numerous academic pressures and demands, undergraduate students with high self-compassion will be able to see themselves and their situations positively, resulting in lower academic burnout. The aim of the study: to investigate the effect of self-compassion on academic burnout in undergraduate students in Indonesia.

### Material and Methods:

This study was conducted using the quantitative approach with a non-experimental design. The Maslach Burnout Inventory-Student Survey (MBI-SS) was used to measure academic burnout ( $\alpha=0.824$ ), and the measurement of self-compassion used the Self-Compassion Scale (SCS) ( $\alpha=0.878$ ), which has been adapted into the Indonesian language. A sample of undergraduate students in Indonesia between the ages of 17 and 25 was taken using the convenience sampling technique. This study used simple linear regression analysis.

### Results:

The regression analysis from data of 474 undergraduate students shows that there is a negative and significant effect of self-compassion on academic burnout in undergraduate students ( $R^2=0.076$ ,  $F=38.960$ ,  $p<0.001$ ). Furthermore, the variable of gender and a current semester each has a significant effect on academic burnout, but the finding reveals the opposite with the age variable.

### Conclusions:

Self-compassion has a negative effect on academic burnout in undergraduate students. This explains that an increase in self-compassion will be followed by reduction in academic burnout in undergraduate students.

### Keywords:

self-compassion, academic burnout, undergraduate students, Indonesian universities, regression

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## Introduction

During college, undergraduate students will face a variety of challenges, such as academic, social, and personal challenges (Aguayo et al., 2019). These challenges include fitting into a new social environment, being away from home, and adjusting to the different class schedule. In academic settings, undergraduate students must dedicate additional time outside of class hours to research study material and complete the coursework, both individually and in groups. As a result of the numerous academic obligations they face, undergraduate students are prone to burnout, which is defined by Yavuz and Dogan (2014) as a feeling of exhaustion mentally and physically. The longitudinal study done by Ohio State University in August 2020 and April 2021 discovered an increase in the number of undergraduate students feeling burnout. The percentage increase was 31%, whereas in August 2020, 40% of undergraduate students experienced burnout, but 71% did in April 2021 (Citroner, 2021).

Furthermore, LM Psychology UGM (2021) research for the representation of academic burnout on 300 undergraduate students of the Faculty of Socio-Humanities UGM found that 73.12% of them experienced high fatigue (exhaustion), 57.03% experienced high cynicism and indifference to tasks (cynicism), and 49.43% experienced a decrease in self-confidence in academic tasks (reduced self-efficacy). According to Schaufeli et al. (2002, as cited in Oyoo et al., 2018), exposure to physically and emotionally demanding tasks over an extensive period can cause burnout. Initially, people in helping professions such as teachers, psychologists, doctors, and nurses were more likely to experience burnout. Undergraduate students have the potential to experience burnout because their primary academic pursuits can be viewed as “work” (J. Lee et al., 2010). Thus, the term burnout can be applied to students, called academic burnout.

A variety of external and internal factors can contribute to academic burnout. According to Lin and Yang (2021), the main external factor that causes academic burnout is high-demand and high-pressure tasks. The lack of support from parents, lecturers, and peer; poor parenting styles, and low socioeconomic status are a few additional factors that might contribute to academic burnout. According to Charkhabi et al. (2014), one of the factors contributing to academic burnout is a lack of resources available to accomplish academic work. Lack of resources could lead to stress, which can lower motivation and hinder undergraduate students' ability to finish activities. Therefore, Charkhabi et al. (2014) concluded that when universities place high academic demands but provide low resources, the likelihood of academic burnout increases.

The personality, self-esteem, and attribution style of an individual are internal factors that contribute to academic burnout. These three factors have an impact on how one responds to negative emotions and circumstances: neurotic personality trait causes the tendency to use maladaptive strategies, including engaging in self-blame behavior; low self-esteem leads

to burnout, which is characterized by exhaustion and demotivation; and stagnant attributional style leads to a resistance to change in the future and in turn, a passive attitude appears, causing the individuals to become more cynical, unmotivated, and emotionally charged (Lin & Yang, 2021). Self-compassion can reduce the potential of burnout because it entails the ability to handle and appraise negative emotions and situations more positively and more effectively (K. Lee & Lee, 2020; Neff, 2003). Therefore, it is stated that self-compassion can prevent academic burnout due to high academic demands (K. Lee & Lee, 2020).

Self-compassion has been described as an attitude of openness, caring, and understanding on a cognitive and emotional level toward one's shortcomings, sufferings, and failures, as one would treat others during hard times (Elices et al., 2017; K. Lee & Lee, 2020; Neff, 2003). Self-compassion can be applied in various contexts, including in the educational setting. The qualitative study (Lockard et al., 2014) shows that undergraduate students with high self-compassion experience lesser negative emotions, deal with their problems in a more rational and accepting manner, and at the same time assume responsibility for their problems. According to Zhang et al. (2016), undergraduate students can also respond to academic failure by seeking help and support from others. They take failure as an opportunity to improve and avoid making the same mistakes (Neff, 2003; Smeets et al., 2014). The authors of the study (Pypenko et al., 2020) found that direct teacher-student contact has a positive impact on the physical and mental health of higher education stakeholders.

The construct of self-compassion consists of three components, each with polar opposites: self-kindness vs. self-judgment; common humanity vs. isolation; and mindfulness vs. over-identification (Neff, 2003). Individuals with adequate self-compassion can understand that suffering and failure are unpleasant (mindfulness) without reducing the kindness toward oneself (self-kindness) because it is a part of the human condition (common humanity), thus enabling them to appropriately cope with those suffering and failure. Conversely, individuals who judge themselves (self-judgment), isolate themselves from others (isolation) and overreact (over-identification) in the face of suffering and/or failure are said to have inadequate self-compassion (Neff, 2003). Dreisoerner et al. (2021) found that self-judgment leads to procrastination, rumination, and a generally lower level of self-improvement. Isolation, on the other hand, leads to stress and burnout (Dreisoerner et al., 2021; Neff, 2003). With self-compassion, individuals perceive negative emotions more positively and take a more rational approach, which allows them to cope effectively (Neff, 2003).

If left untreated, academic burnout may negatively impact one's academic achievement; academic interest; and interactions between undergraduate students and the academic community, including lecturers, staff, and other students (Charkhabi et al., 2014; Rahmatpour et



al., 2019). According to one study on undergraduate students in Iran by Rahmati (2015), prolonged academic burnout causes stress, anxiety, frustration, depression, and low problem-solving skills.

In academic contexts, several studies have found that undergraduate students with high levels of self-compassion experience lower academic burnout (Beaumont et al., 2016a; 2016b; K. Lee & Lee, 2020). Self-compassion in undergraduate students is also a protective factor against chronic academic stress (Zhang et al., 2016), since this causes undergraduate students to perceive academic demands as opportunities for self-development, and to remain treating themselves well, even under academic pressures (Beaumont et al., 2016a; 2016b; K. Lee & Lee, 2020; Zhang et al., 2016).

So far, there has been limited study into self-compassion and its relationship to academic burnout. Most of the literature view self-compassion as a moderating variable, such as a protective factor of emotional responses to chronic academic stress (Zhang et al., 2016); a moderator between academic demands, academic burnout, and depression (K. Lee & Lee, 2020); and a moderator between perceived stress and academic burnout (Paramadina, 2022). Additionally, Sabharwal et al. (2021) looked into the moderating role of academic self-efficacy in the relationship between self-compassion and academic burnout. Some studies on self-compassion and academic burnout are also constrained by sample sizes. Beaumont et al. (2016b) studied self-compassion and burnout in final-year Cognitive Behavioral Psychotherapist (CBP) undergraduate students and Person-Centered Counsellors undergraduate students with a small sample size ( $n=54$ ). In another study, Beaumont et al. (2016a) has its limitation on its small sample ( $n=103$ ) which were midwifery undergraduate students, exclusively from one university in the North West of England, United Kingdom.

Among the limited number of research discussing self-compassion and academic burnout (Paramadina, 2022), none directly seeks to determine the effect of self-compassion on academic burnout.

*The aim of the study.* To investigate the effect of self-compassion on academic burnout in undergraduate students in Indonesia to improve on the findings and to remove some limitations faced by prior studies.

## Materials and Methods

In this study, non-experimental quantitative approach is used since the researchers wish to understand the causal relationship without administering any direct manipulation (Gravetter & Forzano, 2018). In this study, two variables – academic burnout and self-compassion are used.

The population of this study is Indonesian undergraduate students. According to the Higher Education Statistics from the Directorate General of Higher Education of Indonesia (2020), there were 7,113,663 undergraduate students enrolled in 2020. The number of samples to be taken is at least 349 undergraduate students when utilizing the reference

table of Isaac and Michael at the error level of 5% (Sugiyono, 2013). Undergraduate students between the ages of 17 and 25 enrolled in universities in Indonesia constitute the research sample. The sampling method used is convenience sampling (Gravetter & Forzano, 2018), which includes any person who meets the requirements, is the simplest to locate, and is willing to participate in the research as a respondent.

## Measuring Instruments

The Skala Welas Diri (SWD) (Sugianto et al., 2020), adapted from the Self-Compassion Scale (SCS) by Neff (2003), was used to measure self-compassion. The instrument has three factors with respective polar opposites, which are self-kindness vs. self-judgment, common humanity vs. isolation, and mindfulness vs. over-identification. The SWD operationalizes the self-compassion dimensions into six components comprised of 26 Likert-scale items, ranging from 1 (almost never) to 5 (almost always). Psychometric assessment of SWD by Sugianto et al. (2020) using the construct validity tests, Confirmatory Factor Analysis (CFA), and Cronbach's Alpha coefficients yielded a valid and reliable instrument, and showed that SWD has the same theoretical model as SCS. Before proceeding into the measuring process using SWD, SWD underwent a readability test on four individuals to ensure the items are comprehensible. Researchers also ran through a psychometric assessment of SWD, which confirmed the reliability ( $\alpha=0.878$ ) and construct validity (corrected item total correlation  $>0.20$ ) of the instrument. To generate the scale score and component score, the average score is determined by dividing the total score by the number of items, producing a score ranging from 1.00 to 5.00, which signifies the level of self-compassion one has.

Researchers used the Maslach Burnout Inventory-Student Survey (MBI-SS), which has been adapted and translated into Indonesian by Maharani (2019). The reliability testing shows that MBI-SS are reliable with  $\alpha=0.932$  (Maharani, 2019). MBI-SS has 15 items consisting of three dimensions, i.e. exhaustion, cynicism, and efficacy, using the Likert scale with a range of 1 (very unlikely) to 5 (very likely). The greater the individual's academic burnout, the higher the total score. Before implementing the MBI-SS, researchers conducted readability tests on four people, with the conclusion that all of the items could be understood. Researchers' reliability testing results demonstrate that the MBI-SS is reliable ( $\alpha=0.824$ ) and valid (corrected item total correlation  $>0.20$ ). The overall score, which demonstrates the degree of academic burnout experienced, is calculated to obtain a scale score and dimension score.

## Research Procedure

Since the data will be collected virtually and in person, researchers will create the questionnaires in both computerized and printed versions. In addition to the SWD and MBI-SS instruments, researchers will inquire demographic background in the questionnaire such as gender, age, originating university, current major, and current semester. For virtual data collection, researchers



will use Google Forms and share the computer-based questionnaire links on various online social media platforms, such as WhatsApp, Instagram, Telegram, Line, etc. For the person-to-person data collection, the paper-and-pencil questionnaires will be printed out and distributed directly by researchers to undergraduate students several Indonesian universities. The data collection process is planned to be carried out in September 2022 – February 2023.

This study was tested using simple linear regression analysis in the JASP 0.17.0.0 software. Prior to the regression test, researchers ran through a set of assumption tests (Field, 2018), consisting of normality distributed errors, linearity, independent error, and homoscedasticity.

### Results

The period of data collection is September 2022 to February 2023. In this study, 474 college students between the ages of 17 and 25 ( $M=20.25$ ,  $SD=1.52$ ) participated as respondents. Table 1 provides an overview of the characteristics of the respondents. The majority of respondents are female (85.65%), aged between 20–22 years (60.13%), are undergoing semester 5 (16.24%), studying at universities located in Jabodetabek (54.85%), and studying humanities (33.76%).

Table 2 displays the descriptive statistics of the self-compassion and academic burnout variables, alongside the dimensions of each variable. The total score of self-compassion ranges from 1.3–4.5 ( $M=3.22$ ;  $SD=0.52$ ) and the self-compassion component score ranges from 1.0–5.0. The total score of academic burnout ranges from 16.0–17.30 ( $M=45.71$ ;  $SD=9.06$ ) and its dimensions, denote the score variance from the lowest to the highest.

T-test is conducted based on gender for self-compassion and academic burnout. Since the data did not pass the normality assumption test despite passing the homogeneity of variance assumption test, researchers used Mann-Whitney U Test (Table 2). There is no significant difference in self-compassion between female undergraduate students ( $M=3.22$ ,  $SD=0.53$ ) and male undergraduate students ( $M=3.19$ ,  $SD=0.47$ ),  $U=14.722$ ,  $p>0.05$ . There is no significant difference in the entirety of the self-compassion components between male and female undergraduate students. Conversely, academic burnout is shown to be significantly higher in female undergraduate students ( $M=46.11$ ,  $SD=8.98$ ) compared to male undergraduate students ( $M=43.34$ ,  $SD=9.27$ ),  $U=16566.5$ ,  $p<0.05$ . The same result is shown in the Exhaustion and Cynicism dimensions, in which the score of the female undergraduate students is significantly higher than male undergraduate students, with  $U=16875.0$  and  $U=16011.0$ , respectively. Only the Efficacy dimension shows no significant difference between female undergraduate students ( $M=18.68$ ,  $SD=5.72$ ) and male undergraduate students ( $M=18.85$ ,  $SD=6.34$ ),  $U=13470.0$ ,  $p>0.05$ .

**Table 1**

*Descriptive Statistics of Respondent's Characteristics (N=474)*

Variable	Frequency	
	people	percentage
<b>Gender</b>		
Female	406	85.65
Male	68	14.35
<b>Age (years)</b>		
17 – 19	152	32.06
20 – 22	285	60.13
23 – 25	37	7.81
<b>Number of semester</b>		
Semester 1	59	12.45
Semester 2	48	10.13
Semester 3	68	14.35
Semester 4	32	6.75
Semester 5	77	16.24
Semester 6	42	8.86
Semester 7	73	15.40
Semester 8	43	9.07
Semester 9	24	5.06
Semester >9	8	1.69
<b>University distribution, based on geographical unit</b>		
Jabodetabek	260	54.85
Java (Non-Jabodetabek) and Madura	146	30.80
Sumatra and Bangka Belitung Islands	41	8.65
Sulawesi	15	3.16
Bali and Nusa Tenggara	7	1.48
Kalimantan	5	1.05
<b>Major of study</b>		
Humanities (Psychology, Communication Studies, Literature, etc.)	160	33.76
Education (PSTE, Mathematics Education, etc.)	80	16.88
Economics (Accounting, Management, Economics and Business, etc.)	57	12.03
Social Studies (Administration, Law, Journalism, etc.)	42	8.86
Technics (Computer, Architecture, Civil Engineering, etc.)	40	8.65
Medical (Medical, Midwifery, Pharmacy, etc.)	38	8.02
Agriculture (Forestry, Agrobusiness, etc.)	20	4.22
Mathematics and Natural Sciences (Mathematics, Physics, Biology, etc.)	20	4.22
Religious Studies (Islamic Guidance Counseling, Dirosat Islamiyyah, etc.)	13	2.74
Arts (Visual Communication Design, Product Design, etc.)	3	0.63

Before proceeding to linear regression tests, the underlying assumptions of linearity, independent, homoscedasticity, and normally distributed errors have all been met.



**Table 2**  
 Descriptive Statistics of the Variables Based on Total Score and Gender

Variable	Score range	M (SD)						U <sup>a</sup>
		Total		Female <sup>b</sup>		Male <sup>c</sup>		
Self-compassion	1.3 – 4.5	3.22	(0.52)	3.22	(0.53)	3.19	(0.47)	14722.0
Self-kindness	1.0 – 5.0	3.49	(0.74)	3.49	(0.76)	3.47	(0.61)	14414.5
Self-judgment	1.0 – 5.0	2.88	(0.85)	2.88	(0.87)	2.83	(0.72)	14542.0
Common humanity	1.5 – 5.0	3.70	(0.73)	3.70	(0.73)	3.73	(0.73)	13729.5
Isolation	1.0 – 5.0	2.91	(1.05)	2.93	(1.07)	2.81	(0.95)	14856.5
Mindfulness	1.2 – 5.0	3.50	(0.70)	3.47	(0.69)	3.65	(0.69)	11654.0
Over-identification	1.0 – 5.0	2.83	(0.88)	2.85	(0.88)	2.68	(0.93)	15465.0
Academic burnout	16.0 – 73.0	45.71	(9.06)	46.11	(8.98)	43.34	(9.27)	16566.5**
Exhaustion	6.0 – 25.0	16.39	(4.42)	16.64	(4.31)	14.87	(4.75)	16875.0**
Cynicism	4.0 – 20.0	10.62	(3.86)	10.79	(3.85)	9.62	(3.82)	16011.0*
Efficacy	6.0 – 30.0	18.71	(5.81)	18.68	(5.72)	18.85	(6.34)	13470.0

Note. <sup>a</sup>Mann-Whitney test between the score of male and female, <sup>b</sup>n=406, <sup>c</sup>n=68.  
 \*p<0.05, \*\*p<0.01, \*\*\*p<0.001.

The regression results for predicting academic burnout are shown in Table 3. Academic burnout is significantly and negatively influenced by self-compassion ( $R^2=0.076$ ,  $F=38.960$ ,  $p<0.001$ ). Academic burnout will decrease by 4.770 points for every additional 1 score of

self-compassion. 7.6% of self-compassion can predict academic burnout, while 92.4% was predicted by other variables. In accordance with Gravetter and Forzano (2018), self-compassion has a small effect on academic burnout, as shown by its  $R^2$  of 0.076.

**Table 3**  
 Regression Test Results for the Prediction of the Academic Burnout

Regression	Predictor	b	$\beta$	t	R <sup>2</sup>	F
1	Intercept	61.061	-	24.509***	0.076	38.960***
	Self-compassion	-4.770	-0.276	-6.242***		
2	Intercept	75.494	-	9.428***	0.084	15.409***
	Self-compassion	-4.899	-0.284	-6.425***		
	Semester	0.654	0.184	2.620**		
	Age	-0.848	-0.142	-2.027*		
3	Intercept	73.178	-	9.115***	0.100	13.073***
	Self-compassion	-4.929	-0.285	-6.495***		
	Semester	0.604	0.170	2.426*		
	Age	-0.698	-0.117	-1.657		
	Gender <sup>a</sup>	-2.714	-	-2.368*		

Note. <sup>a</sup>male=1, female=0.  
 \*p<0.05, \*\*p<0.01, \*\*\*p<0.001.

By adding the age and semester variables as predictors along with self-compassion, all three significantly affect academic burnout,  $R^2=0.084$ ,  $F=15.409$ ,  $p<0.001$ . The addition of these two predictors increases  $R^2$  by 0.008, although the effect is still small. Self-compassion, semester, and age together can predict academic burnout by 8.4%. Self-compassion and age have negative effect on academic burnout ( $b=-4.899$  and  $-0.848$ , respectively), while the semester has a positive effect ( $b=0.654$ ). This shows that increasing self-compassion and age causes a decrease in academic burnout while increasing semesters will cause an increase in academic burnout. Although these three predictors had a significant effect, self-compassion has the most effect ( $\beta=-0.284$ ).

A fourth predictor, gender, was added to the regression analysis.

These four predictors together have a significant effect on academic burnout,  $R^2=0.100$ ,  $F=13.073$ ,  $p<0.001$ . An  $R^2$  of 0.100 indicates that these four predictors together have a moderate effect (Gravetter & Forzano, 2018). As a result, female undergraduate students will likely experience greater academic burnout than male undergraduate students. The age variable, however, emerged as the only predictor from this regression analysis that did not have a significant effect. Table 4 displays the results of regression test with the self-compassion components as a predictor.



**Table 4**

Results of Regression Test to Predict Academic Burnout with Self-Compassion Components as Predictor

Regression	Predictor	b	β	t	R <sup>2</sup>	F
1	Intercept	67.243	-	25.317***	0.146	14.514***
	Self-Kindness	-1.895	-0.155	-2.703**		
	Self-Judgement	0.023	0.002	0.033		
	Common Humanity	-0.182	-0.015	-0.276		
	Isolation	0.479	0.056	0.831		
	Mindfulness	-3.306	-0.252	-4.236***		
	Over-identification	-1.473	-0.144	-2.205*		
2	Intercept	76.010	-	9.774***	0.176	10.984***
	Self-Kindness	-2.015	-0.164	-2.888**		
	Self-Judgement	-0092	-0.009	-0.131		
	Common Humanity	-0.112	-0.009	-0.171		
	Isolation	0.603	0.070	1.050		
	Mindfulness	-3.144	-0.240	-4.024***		
	Over-identification	-1.696	-0.166	-2.538*		
	Age	-0.537	-0.090	-1.311		
	Semester	0.544	0.153	2.238*		
Gender <sup>a</sup>	-2.342	-	-2.105*			

Note. <sup>a</sup>male=1, female=0.

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

The six components simultaneously has a significant effect on academic burnout,  $R^2=0.146$ ,  $F=14.518$ ,  $p < 0.001$ . When compared to the overall effect of self-compassion ( $R^2=0.076$ ), the effect of self-compassion components are higher and can be categorized as moderate (Gravetter & Forzano, 2018). Only three components, which are Self-Kindness, Mindfulness, and Over-identification, that respectively has a significant effect on academic burnout, where the Mindfulness component has the highest effect ( $\beta=-0.252$ ). If the predictors are added with the variables of age, semester, and gender,  $R^2$  increases to 0.176 ( $F=10.984$ ,  $p < 0.001$ ). As stated in the previous results, only the Self-kindness, Mindfulness, and Over-identification components, and the semester and gender variables have significant effects.

### Discussion

This study aims to seek the effect of self-compassion on academic burnout in undergraduate students. Results show that there is a negative significant effect of self-compassion on academic burnout, indicating that the higher the self-compassion one has, the lower the academic burnout one experiences. The same conclusion is found across research, such as in a study on final-year Cognitive Behavioral Psychotherapist (CBP) undergraduate students and Person-Centered Counsellors undergraduate students (Beaumont et al., 2016b), on midwifery undergraduate students (Beaumont et al., 2016a), and on undergraduate students of counseling classes in Seoul Cyber University (Kyeong, 2013). Individuals with high self-compassion will be more resilient in the face of negative situations, allowing them to become more compassionate and more accepting of their shortcomings and failures, avoid engaging in self-criticism, and overcome existing challenges in a positive and constructive way. High self-compassion also enables

individuals to be able to see and appraise their situations as an opportunity for growth (K. Lee & Lee, 2020; Neff, 2003). When encountering a lot of pressure and demands as undergraduate students, individuals with high self-compassion will be able to see themselves and their situations positively, which leads to lower academic burnout. They will also be able to use emotion-focused coping strategies that reduce fear of failure and negative thoughts (Cheraghian et al., 2016).

Academic burnout is positively influenced by the number of semesters students have completed. This finding indicates that academic burnout increases as a student's time in college lengthens. This condition is understandable given that undergraduate students face more academic fatigue as they take on more challenging coursework and are required to finish their final project or thesis during their final semester. This finding is supported by Salmela-Aro and Upadyaya (Doğru & Kabasakal, 2023), which stated that exhaustion happens during the first year of college study, and escalates into desensitization during the next years. Additionally, Ramirez-Asis et al. (2023) noted that as the number of semesters increase, undergraduate students become more emotionally exhausted and cynical about their academic careers. This also explains why there are only two aspects that significantly differ between male and female undergraduate students: exhaustion and cynicism.

This study also found that age does not have an effect on academic burnout, reiterating the research findings of Aguayo et al. (2019) in students of University of Granada, and García-Izquierdo et al. (2018) in midwifery students of University of Murcia. Researchers suggest that this is due to the shared characteristics of respondents, in which the majority of them are young adults between 17 and 25 years old (Santrock, 2011).

Female undergraduate students experience greater academic burnout than male undergraduate students



when compared by gender. This result can be explained because female students show higher stress levels than male undergraduate students (Castellanos, 2018). Compared to male undergraduate students, female undergraduate students are more likely to employ coping mechanisms that emphasize emotions (Aguayo et al., 2019). Female undergraduate students employ the emotion-focused coping technique to get through the feelings that come with burnout. This condition also explains why the exhaustion and cynicism dimensions in female undergraduate students are higher than in male undergraduate students. This is supported by the findings of a study conducted on medical undergraduate students at the University of Liege, Belgium who found female undergraduate students had higher scores in emotional exhaustion (Kilic et al., 2021).

Self-kindness, mindfulness, and over-identification each have a significant effect on academic burnout, in line with a study on undergraduate students in Ardebil, Iran by Narimani et al. (2018), which concluded the negative effect of self-kindness and mindfulness on academic burnout.

### Conclusions

The research finding supports the notion that self-compassion has a negative effect on academic burnout, which explains that an increase in self-compassion will be followed by a reduction in academic burnout. This study suggests that undergraduate students might use self-compassion as a protective strategy to overcome difficulties in their lectures. Additionally, for undergraduate students to recover from academic burnout, support from significant others is required. Universities can develop a training program or curriculum to improve undergraduate students' self-compassion, hence reducing academic burnout.

However, this study has its limitations, one of which is the lack of diversity, since the majority of respondents came from humanities disciplines of universities in the Jabodetabek region, and none from the East Indonesia region. To generalize the research findings, researchers recommend future research to use the cluster sampling technique with geographical locations and the study major of the universities in mind. Since self-compassion can only predict academic burnout by 7.6-14.6%, future research can include other variables such as personality, self-esteem, academic motivation, perfectionism, and/or academic resiliency.

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### Ethical Approval

The study protocol was consistent with the ethical guidelines of the 1975 Declaration of Helsinki as reflected in a prior approval by the Institution's Human Research Committee.

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## Peculiarities of the Psychological Well-Being and Social Adaptation of Young Students and Cadets in Wartime Conditions



Authors' Contribution:

- A – Study design;
- B – Data collection;
- C – Statistical analysis;
- D – Data interpretation;
- E – Manuscript preparation;
- F – Literature search;
- G – Funds collection

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Abstract

The mental health and social adaptation of young students and cadets in wartime conditions is a new and understudied problem.

The aim of the study: to identify the peculiarities of psychological well-being and social adaptation of students and cadets in wartime conditions.

Our study was conducted among the students and cadets of two Ukrainian universities (KNUIA, UzhNU) in 2023, February. 327 participants were divided into 3 groups: 1) 112 cadets whose permanent disposition was changed in Ukraine; 2) 108 students who were displaced and who are in Ukraine and EU countries; 3) 107 students who did not change their place of permanent residence and who are in Ukraine in the combat zone or near it. The 28-item General Health Questionnaire (GHQ-28) to assess psychological well-being and emotional stability, and the Social Support Questionnaire (F-SozU K-22) to determine the peculiarities of emotional support, practical support, and social integration were used in the study. Appropriate internal consistency values (Cronbach  $\alpha$  between 0.817 and 0.903) were found for both scales.

Group 1 has the best general health indicator: 1.65 times better than Group 3. The levels of somatic symptoms, anxiety and insomnia are lower in Group 1 (practically the same in women and men), and higher in Group 3. The highest rates of social dysfunction are found in Group 3. Men in all groups have more pronounced social dysfunction; women in all groups have more pronounced severe depression. Group 1 total perceived social support is 1.89 times better than Group 3. Emotional support, social integration are highest in Group 1, practical support is highest in Group 2.

The lowest levels of psychological well-being and social adaptation were found in Group 3. This is probably due to uncertainty about the future, constant instability and insecurity. Teachers and psychologists are urged to consider the identified psychological and social peculiarities in the educational and clinical process when dealing with young students.

psychological well-being, social adaptation, social dysfunction, anxiety, depression, somatic symptoms, wartime conditions

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## Introduction

The current war on the territory of Ukraine, caused by Russian aggression, has become a test for all Ukrainian citizens. It particularly affects the less protected sections of the population, including student youth. The regular massive bombardment of civilian homes and public places with missiles and drones, airstrikes on infrastructure, as well as the lack of communication, water, heat, and light are significant stressors on the individual psyche and significantly complicate the learning environment. This has changed the daily life of the students, and they are being forced to adapt to the new conditions. As a result of the massive destruction, several million of people have been forced to leave their homes (Leon et al., 2022; McKee & Murphy, 2022).

According to a study by the International Organization for Migration, more than 15 million Ukrainians have reported a deterioration in their mental health since the war began, and nearly one in four Ukrainians (23%) are in need of mental and psychosocial support (Nguyen, 2022).

According to the World Health Organization, approximately 22% of people living in a conflict-affected region will experience some form of mental disorder over a 10-year period, ranging from mild depression and anxiety to other more severe mental illnesses (Collins, 2023).

One of the most vulnerable categories is student youth, who are forced to hide in bomb shelters or leave areas of active hostilities. The process of adapting to new conditions is sometimes quite difficult, which significantly worsens learning outcomes. During war, young people are affected by the following psychogenic factors: physical, mental and information-psychological overload, personal and family danger, loss of income or job, loss of home and property, risk of death, etc. (Stadnik et al., 2022).

All this leads to a deterioration of psychological well-being, emotional instability and social dysfunction, and requires further research in this area.

It is impossible to develop adequate practical measures of psychological support and psychoprophylaxis without researching these particularities.

*The aim of the study.* To identify the particularities of psychological well-being and social adaptation of students and cadets in wartime conditions.

## Materials and Methods

In February 2023 we included in the study 327 students and cadets of the Military Department of the Kharkiv National University of Internal Affairs (KNUIA) and students of the Uzhhorod National University (UzhNU). The age of the participants ranged from 20 to 27 years

old. The participants were divided into the following three groups:

Group 1 included cadets of the KNUIA, whose permanent disposition was changed in Ukraine, in the amount of 112 people, including 95 (84.8%) males and 17 (15.2%) females.

Group 2 included students of the KNUIA and the UzhNU, who were displaced and who are in Ukraine and EU countries, in the amount of 108 people, including 64 (59.3%) males and 44 (40.7%) females.

Group 3 included students of the KNUIA, who did not change their place of permanent residence and who are in Ukraine in the combat zone or near it, in the amount of 107 people, including 59 (55.1%) males and 48 (44.9%) females.

The assessment was conducted online by posting psychological tests using Google forms or messengers (Telegram, Facebook, WhatsApp) for potential participants. This was due to martial law in Ukraine and the limited capabilities of the respondents. In addition, all groups were observed during remote and face-to-face classes. An individual interview was used when it was necessary.

Participation in this study was voluntary. Informed consent was obtained from all participants before the study was conducted.

The following techniques were used in the current study:

1. The 28-item General Health Questionnaire, GHQ-28 (Goldberg & Hillier, 1979).

The questionnaire is designed to assess psychological well-being and emotional stability. It considers the psychological state as an element of a more general concept – “quality of life”. The GHQ-28 consists of 4 subscales: somatic symptoms, anxiety and insomnia, social dysfunction, severe depression. It allows to assess the level of general health as well as the level of somatic symptoms, anxiety, social dysfunction and depression. Responses were scored on a 4-point Likert scale (from 0 to 3): 0 – Not at all, 1 – No more than usual, 2 – Rather more than usual, 3 – Much more than usual. High scores, which characterize the pole of psychological discomfort, correspond to positive responses to those questions that reveal manifestations of psychological distress and emotional instability. Responses to the questions regarding the expression of positive emotions and psychological stability are scored in reverse order. The higher the average score on a particular scale, the greater the psychological distress.

2. The Social Support Questionnaire, F-SozU K-22 (Fydrich et al., 1999).

The questionnaire is designed to determine the characteristics of emotional and practical support, social



integration. The current study used a 22-item short form of the F-SozU. The questionnaire consists of 3 major scales: emotional support, practical support, and social integration. A certain number of statements correspond to each scale. Responses to direct questions about social support in the questionnaire are scored as follows: 1 – Not at all applied, 2 – Slightly applied, 3 – Moderately applied, 4 – Very applied, 5 – Extremely applied. Responses to negative social support questions are scored in reverse order.

The factorability of the questionnaire is examined. Several criteria are used to determine the factorability of a correlation. The result of Bartlett's sphericity test is

considered statistically significant if the  $p$ -value is  $<0.05$ . The Kaiser-Meyer-Olkin (KMO) measure is used to test sampling adequacy and must be greater than 0.60. Cronbach's alpha is used to estimate the reliability of the instruments based on a required internal consistency of  $>0.70$ .

### Results

The results of the general health assessment in cadets and students of Ukrainian universities during the war are shown in Table 1 (the GHQ-28 questionnaire was used). The mean score on the GHQ-28 was 33.8.

**Table 1**

*Final Scores for General Health Assessment by GHQ-28 Subscales in Cadets and Students of Ukrainian Universities in Wartime Conditions (Points)*

GHQ-28 subscales	Group 1*			Group 2**			Group 3***		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Somatic symptoms	6.0	6.0	6.1	8.1	7.4	9.0	10.6	9.2	12.3
Anxiety and insomnia	6.9	6.8	7.1	8.6	9.5	7.2	10.8	9.1	12.8
Social dysfunction	6.5	6.5	6.4	8.6	9.5	7.2	11.2	12.9	9.2
Severe depression	6.5	6.5	6.7	8.1	7.4	9.2	10.1	9.0	11.3
General health	25.8	-	-	33.4	-	-	42.7	-	-

Note.

\* Group 1 (112 people): cadets whose permanent disposition was changed in Ukraine, including 95 (84.8%) males and 17 (15.2%) females;

\*\* Group 2 (108 people): students who were displaced and who are in Ukraine and EU countries, including 64 (59.3%) males and 44 (40.7%) females;

\*\*\* Group 3 (107 people): students who did not change their place of permanent residence and who are in Ukraine in the combat zone or near it, including 59 (55.1%) males and 48 (44.9%) females.

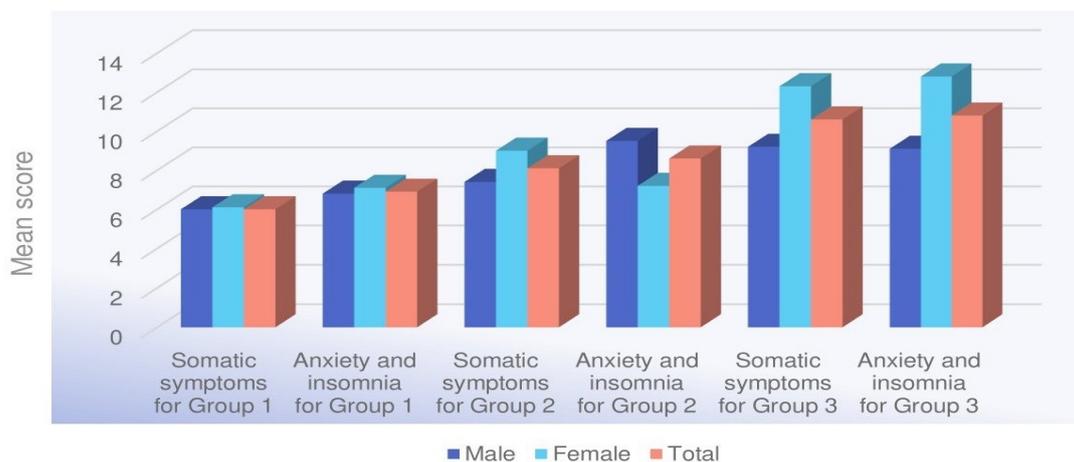
According to the GHQ-28, the total score characterizing borderline mental disorders in wartime conditions is highest among students in Group 3, amounting to 42.7 points. This may be due to the high level of psychological trauma among this category of young students. It should be noted that, considering gender, the score is higher for women (45.6 points) and lower for men (40.3 points). Other groups showed the same trend. The general health index for students of Group 2, living in regions of Ukraine where there are no active

hostilities, is much lower (33.4 points). Group 1 cadets from relatively safe regions of Ukraine had the lowest overall score. It is 25.8 points, which is 1.7 times lower than the score of students in Group 3, who are under regular shelling by Russian troops.

Further elaboration of the General Health Questionnaire allows us to identify manifestations of somatic symptoms, anxiety, social dysfunction, and severe depression. The results for somatic symptoms and anxiety are shown in Figure 1.

**Figure 1**

*Levels of the GHQ-28 Somatic Symptoms and Anxiety in Cadets and Students of Ukrainian Universities in Wartime Conditions*





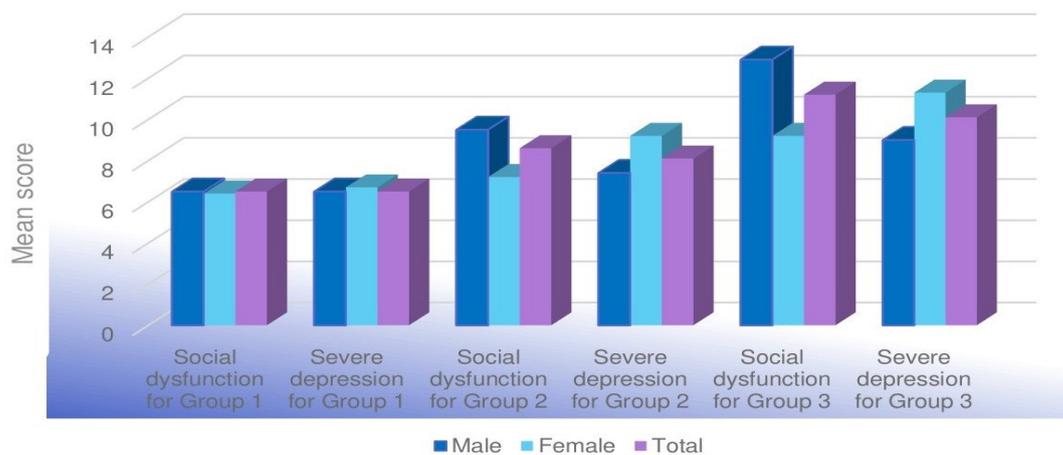
The results show that the cadets of Group 1 (located on the territory of Ukraine outside active hostilities) have a somatization score of 6.0 points, which is slightly lower than the level of anxiety (6.9 points). At the same time, these indicators do not differ significantly between men and women of Group 1 on the scales of somatization (6.0 and 6.1 points) and anxiety (6.8 and 7.1 points), respectively. In our opinion, this is explained by the normalizing influence of a mixed military team, purposeful activity, and fewer vital psychogenes. The highest levels of somatic symptoms and anxiety are found among students in Group 3 (10.6 and 10.8 points,

respectively). It should be noted that among students of Group 3 who are in the territory of active hostilities (Kharkiv region), the index of somatization (12.3 points) and anxiety (12.8 points) among female students is significantly higher than among males (9.2 and 9.1 points, respectively). In personal communication, the most common somatic symptoms were: headache, dizziness, shortness of breath, palpitations, shortness of breath, etc.

The results for social dysfunction and severe depression are shown in Figure 2.

**Figure 2**

*Levels of the GHQ-28 Social Dysfunction and Severe Depression in Cadets and Students of Ukrainian Universities in Wartime Conditions*



In Group 3 (the area of active hostilities in Kharkiv region), indicators of social dysfunction (mean score - 11.2) and severe depression (mean score - 10.1) are significantly higher than in Group 2 (8.6 and 8.1 points, respectively) and Group 1 (6.5 points for each). This indicates an extremely high level of psychogenic distress in this group. The gender feature of the study is that social dysfunction is more pronounced among men in all groups. In addition, it is highest for men in Group 3, at 12.9 points, which is almost 2 times higher than in Group 1 (6.5 points). Depression is more pronounced among women in all groups, with the highest level of depression in Group 3 at 11.3 points.

Bartlett's sphericity test reached statistical significance for the correlation matrix of the GHQ-28 ( $p < 0.001$ ) and the KMO measure is 0.881. This indicates a reasonable factorability of the correlation matrix. The GHQ-28 is internally consistent, as indicated by Cronbach's alpha for the four subscales: Somatic Symptoms  $\alpha = 0.842$ ; Anxiety and Insomnia  $\alpha = 0.879$ ; Social Dysfunction  $\alpha = 0.836$ ; Severe Depression  $\alpha = 0.817$ ; for the total scale  $\alpha = 0.903$ . These values indicate the homogeneity of the items in each of the dimensions of the scale.

We also noticed an interesting pattern. The hierarchy of mean scores in the study groups is the same: the social dysfunction scale ranks first, anxiety is second, depression is third, and somatic symptoms are fourth. This indicates a certain structure of preclinical psychological disorders among schoolchildren in wartime conditions, where social adaptation disorders

come to the fore. Therefore, we conducted a study using the Social Support Questionnaire, F-SozU K-22, to determine the level of social disadaptation among student youth in wartime conditions.

Table 2 and Figure 3 show the results of the manifestation levels for social adaptation and support disorders (the Social Support Questionnaire, F-SozU K-22, was used).

We found that the total value of perceived social support is the highest among cadets of Group 1 who live outside Kharkiv region (64.8 points), and the lowest among students of Group 3 who are in Ukraine in the combat zone or near it (34.2 points). This is probably due to the uncertainty of the future, constant instability and danger. These students have a tendency to live one day at a time. At the same time, emotional support is the highest among cadets of Group 1 (25.7 points), while it is much lower among students of Groups 2 and 3 (17.6 and 12.3 points, respectively). This is probably due to the presence of an established team where the interaction between cadets is based on mutual assistance, mutual support, interchangeability, and low conflict. It should be noted that, in contrast to other groups, emotional support is significantly higher among women in Group 3 (13.3 points) than among men (11.5 points). This may be due to the fact that women are the ones who stay with children and elderly parents, and are usually in the same room when residential buildings are damaged by shelling.



**Table 2**

*Final Scores for the Assessment of Social Support Parameters in Cadets and Students of Ukrainian Universities in Wartime Conditions (Points)*

Parameters	Group 1*			Group 2**			Group 3***		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Emotional support	25.7	25.7	25.5	17.6	17.1	18.4	12.3	11.5	13.3
Practical support	12.9	12.6	14.2	13.7	14.2	12.9	8.2	9.2	7.0
Social integration	26.2	26.1	26.9	20.4	19.5	21.8	13.7	13.5	14.0
Perceived social support	64.8	-	-	51.7	-	-	34.2	-	-

Note.

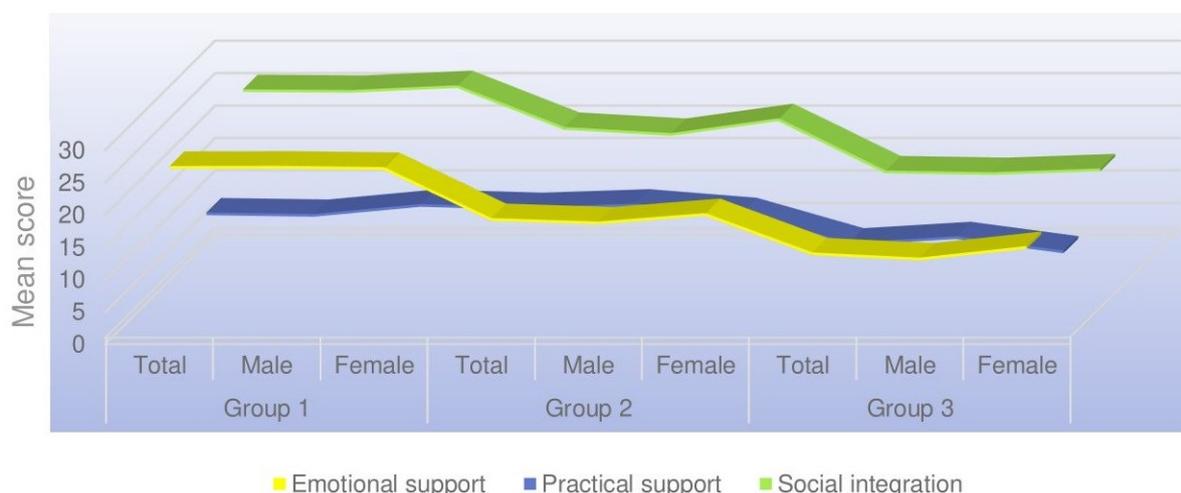
\* Group 1 (112 people): cadets whose permanent disposition was changed in Ukraine, including 95 (84.8%) males and 17 (15.2%) females;

\*\* Group 2 (108 people): students who were displaced and who are in Ukraine and EU countries, including 64 (59.3%) males and 44 (40.7%) females;

\*\*\* Group 3 (107 people): students who did not change their place of permanent residence and who are in Ukraine in the combat zone or near it, including 59 (55.1%) males and 48 (44.9%) females.

**Figure 3**

*Levels of Social Support Parameters in Cadets and Students of Ukrainian Universities in Wartime Conditions*



Practical support is the highest among students of Group 2 (13.7 points), which, in our opinion, is related to the possibility of working abroad or in the territory of Ukraine not affected by the war. The level of practical support is lowest among students in Group 3 (8.2 points), who are in the area of active hostilities, have no opportunity to earn money, and live on humanitarian aid and their own savings. In addition, they live in difficult conditions, with a lack of information due to the instability of the Internet, cellular communications, and interruptions in the supply of water, heat, and electricity. Group 1 cadets have a high level of social integration (26.2 points). This is probably due to the attention and mutual understanding of others and the existence of safe, trusting relationships within the cadet team. For students in Group 2 (20.4 points) and Group 3 (13.7 points), this level is much lower. This is probably due to their inability to adapt to new conditions (active hostilities) and communities (living abroad), part-time jobs and low wages.

The F-SozU K-22 is internally consistent, as indicated by Cronbach's alpha for the main scales: Emotional Support  $\alpha=0.88$ ; Practical Support  $\alpha=0.86$ ; Social

Integration  $\alpha=0.87$ ; for the total Perceived Social Support scale  $\alpha=0.90$ . These values indicate the homogeneity of the items in each of the dimensions of the scale.

### Discussion

The peculiarities of psychological well-being and social adaptation of cadets and students in war conditions turned out to be an insufficiently studied and a relevant topic from the theoretical point of view. Since 1945, Europe has not seen such a large-scale war that would affect the lives of hundreds of thousands of students.

To ensure the objectivity of the study, two universities located in different (opposite) regions of Ukraine were selected. The study was conducted among students and cadets in various university settings.

KNUIA is located in eastern Ukraine, in the city of Kharkiv with a population of 1,421,125 people as of January 1, 2022 (Ministry of Finance of Ukraine, 2022a). This city is the second largest in Ukraine in terms of population and the first in terms of the number of student youth. There are over 30 public universities. This does not include private universities, colleges and other educational institutions for young people. KNUIA



educates students and cadets, so the research we conducted there gave us the opportunity to study a sample of students in various forms of their education.

UzhNU is located in western Ukraine, in the city of Uzhhorod with a population of 115,449 people as of January 1, 2022 (Ministry of Finance of Ukraine, 2022b). We chose this city and this university for several reasons. Uzhhorod, like Kharkiv, is a regional center with the presence of university youth. However, it is much smaller. The city was not surrounded or occupied by Russian troops as part of the territory in the Kharkiv region. It was also the least exposed to rocket and air attack during the war. It also received many internally displaced persons, including young people. UzhNU is a typical and rather large university in Ukraine, with students in 20 faculties.

In this way, we have been able to study the problem of the effects of war on the psychological well-being of young students under different conditions: among students in or near a combat zone, among students and cadets in various forms of education in a relatively non-combatant area with a large number of internally displaced persons, and among refugee students in EU countries.

In recent years, a number of studies have been conducted on the psychological problems of refugees who have been forced to leave their homes and have been displaced to other countries because of hostilities in their homeland.

The problems of Syrian refugees in Turkey (Oppedal et al., 2018), Lebanon (Abu-Amsha & Armstrong, 2018), and Germany (von Haumeder et al., 2019) have been studied. They were found to have psychological problems such as anxiety, depression, post-traumatic stress disorder (PTSD).

Social support, resilience, and mental health in low-intensity warfare were explored among a sample of Palestinian university students living in the Gaza Strip (Veronese et al., 2022). Among these students, researchers found an increase in mental disorders in the form of anxiety, depression, and acute stress.

The role of spirituality and resilience in overcoming difficulties and adapting was studied with Yemeni refugee students in Saudi Arabia. Garoon et al. (2022) identified five basic coping and adaptation techniques used by students to improve their lives. Two techniques involved spiritual practices, and three techniques could be classified as social and psychological – optimism, building new relationships, and the role of family support.

An international study by Marchi et al. (2022) explored the problems of refugees and migrants in Europe. They found the presence of psychological stress leading to mental health problems.

Scientists regularly conducted research on the impact of war on people in various aspects of population migration (Mesa-Vieira et al., 2022), their mental health, etc.

The scale of Russian aggression against Ukraine was unprecedented since World War II, resulting in the largest mass displacement of people from their homeland in modern history (Patel & Erickson, 2022).

According to the researchers (Michalek et al., 2022), the experience of war and displacement can have profound effects on children's affective development and mental health. However, the mechanisms underlying these effects remain unknown.

Gilreath et al. (2022) studied stressors that can affect the academic performance and well-being of youth in wartime conditions. These risk factors include mental, emotional, and behavioral problems. Suicidal tendencies, substance use and abuse may manifest in the short and long term.

The problem of increased substance use and abuse in wartime has become a topical issue, particularly among nonprofessional military personnel, leading to an increase in psychiatric hospitalizations (Haydabrus et al., 2022).

We note this because it is important to consider that the adult civilian population of Ukraine was mobilized for defense and combat operations. In addition, many of the students, like their fathers, have decided to take an active part in the defense of their country. They temporarily interrupted their studies by taking academic leave.

Being in a war zone has negative psychological effects on civilians and military personnel. Rozanov et al. (2019) found that both military and civilian populations suffer from a similar set of disorders and psychological consequences caused by extreme trauma, including PTSD, depression, anxiety, addiction, somatization with chronic pain, dissociation, psychosocial dysfunction, and suicidal behavior.

It should be noted that the problem of Russian military aggression against the population of Ukraine attracted the attention of the general scientific community only after the large-scale invasion in February 2022. However, this military aggression began in 2014 with the seizure of Ukrainian territory, particularly the Donbass region and the Crimean peninsula. Moreover, it has continued all this time.

During this time, we have had the opportunity to conduct a number of psychological studies with military personnel, cadets, and students. This allowed us to study the dynamics of mental health of this category of people during military operations in Ukraine, which have been exacerbated in recent years by the emerging pandemic of coronavirus infection (Melnyk & Stadnik, 2018; Melnyk et al., 2019; 2020), as well as to continue its study in the new realities of military operations.

These studies correlate with the results of preliminary studies of Ukrainian refugee and internally displaced students that began in 2022 (Kurapov et al., 2022; Stadnik et al., 2022). The negative impact of the war in Ukraine on the mental health of student youth is based on them.

We believe that the trends identified in this study will be characteristic of refugee students regardless of their country of study. Peculiarities of students' psychological well-being and social adaptation will depend on their proximity to and involvement in the combat zone.

Taking into account the identified peculiarities of psychological state and social adaptation of cadets and students in war conditions, practicing psychologists



should choose the most rational measures of psychological assistance and psychoprophylaxis. In addition to the traditional areas of activity (diagnostics, counseling, and training), special attention should be paid to modern psycho-correctional methods of work.

One of these techniques can be the psychological transformation game "My Dao" developed by Melnyk and Stadnik (2021), which has proven to be an effective method of psycho-correctional work with students, including in the context of the war in Ukraine.

### Conclusions

Based on the results of this study, it can be concluded that the closer students are to the combat zone, the greater the negative impact on their mental health.

The research conducted with the help of GHQ-28 showed that students living in the area of active hostilities in Kharkiv region (Group 3) have the worst values of the general health indicator among all groups. The high level of psychological trauma among this category of young people explains this. It is higher for women and lower for men in all groups of respondents. Group 1 has the best general health indicator: 1.65 times better than Group 3. The levels of somatic symptoms and anxiety in cadets outside of active combat operations (Group 1) are the lowest, while those in active combat operations (Group 3) are the highest. Gender peculiarities of somatic symptoms and anxiety are their rather higher level among female students of Group 3 than among males. The levels of somatic symptoms in female and male cadets in Group 1 are practically the same. The level of social dysfunction and severe depression among students in Group 3 (area of active hostilities) is significantly higher than in Group 2 (area of Ukraine and EU countries) and Group 1 (area of Ukraine). It should be noted that social dysfunction is more prevalent among men in all groups. At the same time, it is about 2 times higher for men in Group 3 than for men in Group 1. Depression is more prevalent among women in all groups.

According to the F-SozU K-22, the overall level of social support during the war is highest among cadets in Group 1 and lowest among students in Group 3, who are in the area of active hostilities and live mainly on humanitarian aid and their own savings. Group 1 has total perceived social support in 1.89 times better than Group 3.

A detailed analysis of the F-SozU K-22 parameters for perceived social support showed that emotional support and social integration were highest among cadets in Group 1 (area outside of active hostilities). At the same time, emotional support was significantly higher among women in Group 3 than among men. The highest rates of practical support were found among students in Group 2 (Ukraine and EU countries). Total perceived social support is low for students in Groups 3 and 2. This is probably due to the uncertainty of the future, constant instability and danger.

The analysis of the GHQ-28 and the F-SozU K-22 confirmed the internal consistency of both the scale and its dimensions, as well as the homogeneity of the items in each of the scale's dimensions.

As this study was limited by the location and time of data collection, therefore further research is needed. Future research will examine in detail the differences between students who stayed in the country during martial law and those who continued their studies in other countries, as well as the long-term effects of the war on students' mental health.

In addition, the uncertainty of the timing of the Russian aggression on the territory of Ukraine, as well as the consequences of its impact on the state in general and on Ukrainian youth in particular, make this study an intermediate step in the amount of work that has to be done in a near future by scholars in the fields of Education, Psychology, Medicine, Sociology, and others.

### Acknowledgments

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### Ethical Approval

The study protocol was consistent with the ethical guidelines of the 1975 Declaration of Helsinki as reflected in a prior approval by the Institution's Human Research Committee.

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## SOCIAL AND BEHAVIORAL SCIENCES

### Health Care Sciences



ORIGINAL RESEARCH



## Role of Lipid Profile, Apolipoproteins, and Their Ratio for Prediction of Cardiovascular Disease in Essential Hypertension



### Authors' Contribution:

- A – Study design;
- B – Data collection;
- C – Statistical analysis;
- D – Data interpretation;
- E – Manuscript preparation;
- F – Literature search;
- G – Funds collection

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### Abstract

Dyslipidemia is a risk factor for cardiovascular disease, and lipid metabolism changes are linked to essential hypertension. The aim of the study: to investigate the significance of lipid parameters, apolipoproteins, and their ratio in predicting cardiovascular disease among individuals with essential hypertension.

250 patients with essential hypertension and 250 healthy control subjects were enrolled in this case-control study and their serum lipids and apolipoproteins were analyzed. Differences between cases and controls were examined using independent sample t-test and, a p-value <0.05 was considered significant.

In the essential hypertensive group, fasting blood glucose (FBG), total cholesterol (TC), triglyceride (TG), low-density lipoprotein cholesterol (LDL-C), very low-density lipoprotein cholesterol (VLDL-C), apolipoprotein B100 (Apo B100) and Apo B100/Apo A1 ratio were increased significantly compared to control subjects. Essential hypertensive patients had significantly decreased levels of apolipoprotein A1 (Apo A1) and high-density lipoprotein cholesterol (HDL-C) compared to controls. Moreover, age, body mass index (BMI), FBG, TC, TG, LDL-C, and VLDL-C, as well as the Apo B100/Apo A1 ratio, were significantly positively correlated with both systolic blood pressure (SBP) and diastolic blood pressure (DBP), but HDL-C and Apo A1 were significantly negatively correlated in essential hypertensive subjects. There was a significant positive correlation between apo B100 and SBP in people with essential hypertension. Apo B100 and DBP showed a positive association, however, it was not statistically significant.

Essential hypertensive people with dyslipidemia and an elevated Apo B100/Apo A1 ratio are at an increased risk for the development of cardiovascular disease.

essential hypertension, dyslipidemia, apolipoproteins, cardiovascular disease, systolic blood pressure, diastolic blood pressure

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## Introduction

The prevalence of hypertension has increased to the point where it is now a serious public health issue worldwide. It is the leading cause of chronic illness treated in primary care clinics and the most common type of non-communicable disease (Kossaify et al., 2014). In 1975, there were 590 million people (14.5%) with high blood pressure around the world. This number went up to 1.13 billion (15.3%) in 2015. The number of people with high blood pressure is expected to rise to 1.56 billion by 2025 (Forouzanfar et al., 2017). In India, the prevalence of hypertension among adults is generally over 30%, with 34% in urban areas and 28% in rural areas (Anchala et al., 2014).

Ninety percent of those who are diagnosed with hypertension have essential hypertension, which is defined as having high blood pressure for no obvious reason. Idiopathic persistent elevation of the systemic arterial pressure characterizes essential hypertension (Kossaify et al., 2013). In addition to dietary patterns, variables such as obesity, smoking, alcohol intake, and dyslipidemia are key contributors to the development of hypertension (Bhavani et al., 2003).

Dyslipidemia arises as a result of alteration in lipid metabolism and is considered a risk factor for atherosclerotic cardiovascular disease (Hussain et al., 2019). It is well-established that hypertension is linked to disturbances in lipid metabolism, which in turn lead to abnormalities in blood lipid and lipoprotein levels. The prognosis of hypertensive patients is also significantly hampered by the presence of hyperlipidemia, as has been well reported (Harvey et al., 1990). A tight relationship between dyslipidemia and hypertension has been suggested by several researchers (Nayak et al., 2016; Osuji et al., 2012). However, conventional lipid biomarkers do not provide sufficiently reliable measurements of dyslipidemia. Low-density lipoprotein cholesterol (LDL-C), very low-density lipoprotein cholesterol (VLDL-C), and intermediate-density lipoproteins (IDL) all contain transporting molecules like apolipoprotein B (Apo B), so determining these molecules allows for a more accurate estimation of atherogenicity than the traditional lipid parameters. Apolipoprotein A1 (Apo A1) is a key component of HDL-C, the antiatherogenic lipoprotein. Apo A1 is favored over high-density lipoprotein cholesterol in predicting cardiovascular diseases (HDL-C). The Apo B/Apo A1 ratio thus appears to be a more precise and comprehensive biomarker of lipid metabolism and cardiovascular disease prediction (Nurtazina et al., 2020).

Multiple studies have elucidated that lipid markers play role in essential hypertension (Bhavani et al., 2003; Osuji et al., 2012). However, the predictive value of apolipoproteins and their ratio (Apo B100/Apo A1 ratio) in cardiovascular disease risk assessment is still not well recognized. Because of the paucity of information on apolipoproteins in essential hypertension, we undertook this study to better understand the role of lipid parameters, apolipoproteins, and their ratio (Apo

B100/Apo A1 ratio) for the prediction of cardiovascular disease in essential hypertension.

*The aim of the study.* To investigate the significance of lipid parameters, apolipoproteins, and their ratio in predicting cardiovascular disease among individuals with essential hypertension.

## Materials and Methods

This case-control study was conducted in the Department of Biochemistry, Shyam Shah Medical College, Rewa, Madhya Pradesh, India over 12 months after receiving ethical clearance from Institutional Ethical Committee. A total of 500 subjects of either sex were selected for the present study. Of these, 250 were patients with essential hypertension and 250 were healthy control subjects. 250 patients of essential hypertension (of either sex) of the age group 35-75 years were selected from the OPD of Medicine ward of Shyam Shah Medical College and associated Hospital, Rewa, Madhya Pradesh, India. The JNC 7 (Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure) criteria were used to determine which cases of essential hypertension should be included (Chobanian et al., 2003). 250 normal healthy subjects of the same age group with no symptoms and signs suggestive of hypertension and no family history of the hypertensive disease were selected from in and around the hospital as controls. Informed written consent was obtained from each participant once they had been fully explained about the study.

Patients with the following disease/condition were excluded from the present study: secondary hypertension, severe hepatic failure, renal failure, unstable cardiovascular condition, past incidences of cerebrovascular conditions, collagenous tissue disease, malignancy, thyroid disease, severe depression, dementia, and diabetes mellitus. Pregnant women were also excluded from the present study.

The standard apparatus was used to take measurements of both height and weight with the subjects dressed in minimal clothing and barefoot. Calibrated electronic weighing scales were used for the measurement of weight whereas height was measured to the nearest centimeter using a portable stadiometer. Body mass index (BMI) was calculated as weight in kilograms, divided by height in meters squared ( $\text{kg}/\text{m}^2$ ). The same person took all of the anthropometric measurements.

Following a resting period of 10 minutes, both the systolic and diastolic blood pressures were measured using a mercury sphygmomanometer following an accepted medical practice.

Under aseptic conditions, about 05 ml of fasting venous blood was drawn from both patients with essential hypertension and control participants, and the sample was distributed into two tubes based on the analysis to be done. Approximately 2 ml of blood was drawn into a fluoride bulb to determine fasting plasma glucose and the remaining 03 ml blood sample was dispensed into the plain tube for analysis of lipid parameters and apolipoproteins. After drawing blood, the samples were



centrifuged for 10 minutes at 3000 rpm to get serum/plasma. The routine biochemical parameters were analyzed by standard methods using a Biosystem BA-400 chemistry analyzer. Apo B100 and Apo A1 were measured by turbidimetric immunoassay, endpoint method. Low-density lipoprotein and very low-density lipoprotein cholesterol were calculated using Friedewald's equation (Friedewald et al., 1972).

**Statistical analysis**

The data were analyzed using Statistical Package for Social Science version 20 (IBM, SPSS Statistics 20, Armonk, NY, USA) and results were presented as mean±SD values. GraphPad Prism 5 was used to create the graph. Statistical differences between cases and controls were examined using the “student independent

sample t-test”. The chi-squared test ( $\chi^2$  test) was applied to the categorical information. To ascertain the correlation between important parameters, Pearson's correlation coefficient was determined. Significant was defined as the *p*-value is less than 0.05.

**Results**

Table 1 shows the baseline characteristics of the studied subjects. Patients with essential hypertension and those serving as controls were statistically indistinguishable from one another in terms of age and gender. Body mass index, SBP, and DBP were statistically significantly increased in essential hypertension cases compared to controls.

**Table 1**

*Baseline Characteristics of Studied Subjects*

Variables	Controls	Cases
Age (years)	48.24±11.23	48.70±11.82 <sup>NS</sup>
Sex (M/F)	113/137	114/136 <sup>NS</sup>
BMI (Kg/m <sup>2</sup> )	21.89±1.00	27.60±1.68**
SBP (mmHg)	115.32±3.95	155.35±7.40**
DBP (mmHg)	76.12±4.95	96.03±5.57**

*Note.* <sup>NS</sup>Not significant (*p*>0.05); \*\*Significant at *p*<0.001; BMI=Body mass index; SBP=Systolic blood pressure; DBP=Diastolic blood pressure.

Table 2 shows fasting blood glucose and lipid profiles in the studied subjects. In essential hypertension subjects, fasting blood glucose (FBG) and all the lipid parameters i.e. TC, TG, LDL, and VLDL except HDL were increased compared to control subjects and were statistically significant whereas HDL was statistically

significantly reduced in essential hypertension subjects. Apolipoprotein B100 was increased in essential hypertension subjects whereas Apo A1 was reduced compared to normal healthy control subjects and these differences were statistically significant.

**Table 2**

*Fasting Blood Sugar and Lipid Profile in Studied Subjects*

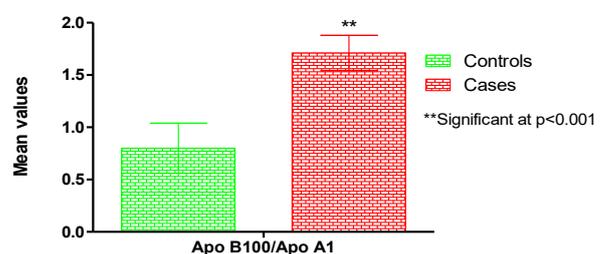
Variables	Controls	Cases
FBG (mg/dl)	85.08±6.23	95.01±7.22**
TC (mg/dl)	170.74±12.40	220.57±11.48**
TG (mg/dl)	135.37±7.77	236.32±47.10**
HDL-C (mg/dl)	52.83±4.67	37.34±3.98**
LDL-C (mg/dl)	90.83±13.35	135.97±11.63**
VLDL-C (mg/dl)	27.07±1.55	47.26±9.42**
Apo A1(mg/dl)	128.96±25.73	87.83±4.14**
Apo B100 (mg/dl)	99.50±22.44	149.87±11.30**

*Note.* \*\*Significant at *p*<0.001; FBG= Fasting blood glucose; TC=Total cholesterol; TG=Triglyceride; HDL-C=High density lipoprotein cholesterol; LDL-C=Low density lipoprotein cholesterol; VLDL-C=Very low density lipoprotein cholesterol.

Figure 1 shows the comparison of the Apo B100/Apo A1 ratio between essential hypertension subjects and controls. Essential hypertension patients had significantly increased levels of Apo B100/A1 ratio compared to control subjects.

Table 3 shows the correlation of studied parameters with systolic blood pressure and diastolic blood pressure in essential hypertension subjects.

**Figure 1 Comparison of Apo B100/Apo A1 Ratio between Cases and Controls**





**Table 3**

*Correlation of Studied Parameters with Systolic Blood Pressure and Diastolic Blood Pressure in Essential Hypertension Subjects*

Variables	With SBP		With DBP	
	r-value	p-value	r-value	p-value
Age	0.299	0.000**	0.225	0.000**
BMI	0.635	0.000**	0.527	0.000**
FBG	0.393	0.000**	0.286	0.000**
TC	0.540	0.000**	0.388	0.000**
TG	0.623	0.000**	0.462	0.000**
HDL	-0.449	0.000**	-0.350	0.000**
LDL	0.183	0.004**	0.129	0.042*
VLDL-C	0.623	0.000**	0.462	0.000**
Apo A1	-0.401	0.000**	-0.301	0.000**
Apo B100	0.148	0.019*	0.111	0.080 <sup>NS</sup>
Apo B100/Apo A1	0.306	0.000**	0.232	0.000**

Note. <sup>NS</sup>Not significant ( $p>0.05$ ); \*\*Correlation is significant at the 0.01 level (2-tailed); \*Correlation is significant at the 0.05 level (2-tailed); BMI=Body mass index; SBP=Systolic blood pressure; DBP=Diastolic blood pressure; FBG= Fasting blood glucose; TC=Total cholesterol; TG=Triglyceride; HDL-C=High density lipoprotein cholesterol; LDL-C=Low density lipoprotein cholesterol; VLDL-C=Very low-density lipoprotein cholesterol.

In essential hypertension participants, age, BMI, FBG, lipid measures such as TC, TG, LDL, and VLDL, as well as the Apo B100/Apo A1 ratio, were significantly positively associated with both SBP and DBP, but HDL and Apo A1 were significantly negatively correlated. In persons with essential hypertension, there was a significant positive correlation between Apo B100 and SBP. Despite a favorable correlation between Apo B100 and DBP, it was not statistically significant.

### Discussion

This case-control study took place in a hospital setting and included patients with essential hypertension. In the current study, an attempt was made to describe the abnormality of lipid parameters, apolipoproteins, and their ratio (Apo B/Apo A1 ratio) among patients with essential hypertension in a central Indian setting.

The present study found that both systolic and diastolic blood pressures were significantly higher in participants with essential hypertension compared to controls. This is in line with previous studies (Mahapatro et al., 2020; Nayak et al., 2016; Osuji et al., 2012; Pyadala et al., 2017; Sur et al., 2015). As blood pressure rises, so does the chance of cardiovascular events; the more hypertensive a person is, the greater the likelihood that he/she may suffer from cardiovascular disease. Since there was no statistically significant age difference between the people with essential hypertension and the controls, it can be concluded that the study participants were age-matched. In hypertensive participants, however, age was found to have a positive and statistically significant relationship with both systolic and diastolic blood pressures. Systolic blood pressure increases with age, which may be caused by an increase in artery stiffness brought on by atherosclerotic changes to the arterial wall. Numerous epidemiological studies have emphasized the link between arterial stiffness in hypertension patients and

other cardiovascular illnesses in older individuals as compared to younger people. There is an upward trend in the prevalence of hypertension and vascular stiffness as people age (AlGhatrif et al., 2013; Ferreira et al., 2012). Additionally, compared to controls, the hypertension participants in this study had statistically significantly higher BMI, which is consistent with studies done by Nayak et al. (2016); Osuji et al. (2012); Sur et al. (2015). Moreover, BMI was positively related to both SBP and DBP in essential hypertension subjects. This is due to the association between a greater BMI and a higher plasma volume and cardiac output. Therefore, obesity is a risk factor for hypertension. Losing weight has a significant influence on reducing cardiovascular morbidity and mortality in hypertensive people, including stroke, heart attack, and heart failure (Linderman et al., 2018).

In this study, essential hypertension participants had significantly higher fasting blood sugar levels than control subjects. This is following the study carried out by Nayak et al. (2016), who reported statistically significant increased levels of fasting blood sugar in both stage I and stage II hypertensive subjects. Furthermore, in our study, we found a significant and positive correlation of fasting blood sugar with both systolic and diastolic blood pressure in essential hypertension subjects. As the fasting blood glucose level increases as a result of metabolic disorders, obesity, and hyperglycemia with insulin resistance, the renin-angiotensin system (RAS) may undergo alterations. This may have an effect on the patient's blood pressure (Jia et al., 2016; Zhou et al., 2015).

Alterations in lipid metabolism leading to abnormalities in blood lipid and lipoprotein levels have been related to hypertension. It has also been demonstrated that hyperlipidemia dramatically worsens the prognosis in hypertensive individuals (Harvey & Beevers, 1990). An abnormality in blood lipid and lipoprotein levels (also



known as dyslipidemia) is a major, controllable risk factor for cardiovascular disease (CVD) (Kannel et al., 1971). Abnormal serum lipid and lipoprotein levels have been identified as independent risk factors for essential hypertension, giving rise to the term “dyslipidemic hypertension” (Williams et al., 1988). In subjects with essential hypertension, we found that all of the lipid parameters (total cholesterol, triglycerides, low-density lipoprotein cholesterol and very low-density lipoprotein cholesterol) were significantly higher than in controls, except for HDL, which was significantly lower. These results are consistent with the studies done by Mahapatro et al. (2020) and Nayak et al. (2016). Osuji et al. (2012) also found such a type of dyslipidemic pattern in hypertensive subjects compared to control subjects. In addition, we found a significant positive association of TC, TG, LDL-C, and VLDL-C with both systolic and diastolic blood pressures in essential hypertension subjects whereas HDL-C was significantly negatively associated with SBP and DBP in cases of essential hypertension. Hypertension and dyslipidemia are both well-known contributors to the development of cardiovascular disease (Carmena et al., 2004; Gotto, 2005). Endothelial dysfunction, which is exacerbated by dyslipidemia, is a major contributor to the etiology of several cardiovascular disease risk factors, including atherosclerosis, thrombosis, insulin resistance, and hypertension. Endothelial cells are known to be negatively affected by low-density lipoprotein (LDL) cholesterol and lipoproteins high in triglycerides, while high-density lipoprotein (HDL) cholesterol may have protective effects (O’Connell & Genest, 2001). Macrovascular problems like coronary heart disease (CHD) and stroke have been linked to elevated blood cholesterol levels (Albuche et al., 2000). Lewis suggested that blood TC in the range of 5.0-6.5mmol/L may be regarded as undesirable due to the increased risk of coronary heart disease when the cholesterol level reaches 5.0 mmol, as observed in various epidemiological studies (Lewis, 1986; McGill, 1968). Low HDL levels are associated with an increased risk of cardiovascular disease, albeit the reasons why are not well understood. According to experiments, HDL-C helps increase the outflow of cholesterol from foam cells in vascular atherosclerotic plaque depots to the liver, where it may be broken down and eliminated. HDL-C also possesses powerful anti-inflammatory and antioxidant characteristics, which lower the likelihood of developing atherosclerosis (Barter et al., 2004; Mackness et al., 2000). It has also been shown that the existence of additional atherogenic risk factors is linked to a low HDL-C level. According to Pavithran et al. (2007), modifications in lipid metabolism, including a drop in HDL-C, might result in endothelial damage and increased blood pressure, which may help to partially explain why it has such a high predictive value for coronary heart disease. It is well known that dyslipidemia and hypertension frequently coexist. This relationship has been attributed to underlying central obesity and the accompanying insulin resistance, which are crucial to the pathophysiology of both hypertension and dyslipidemia.

A 7-year follow-up study on Finnish males revealed that dyslipidemia, a component of the metabolic syndrome, foreshadowed the onset of hypertension (Laaksonen et al., 2008). Furthermore, Halperin et al. (2006) have shown that hypertension is brought on by dyslipidemia in people who appear to be in good health. According to Hausmann et al., people who have elevated TG levels along with low HDL-C have more widespread coronary atheromas than people who only have elevated LDL-C (Hausmann et al., 1996).

Numerous studies have demonstrated the significance of apolipoproteins- Apo A1 & Apo B100, the two main apolipoproteins for lipid transport in the processes of atherosclerosis and its consequences (Luc et al., 2002; Meisinger et al., 2005; Walldius et al., 2001; Yusuf et al., 2004). However, the association between apolipoprotein levels and the risk of hypertension has only been discovered in a few studies. Nayak et al. (2016) observed a non-significant fall in the value of serum Apo A1 in the hypertensive patients when compared to controls whereas a significant increasing trend was observed in the levels of Apo B100 from the control group to Stage I and Stage II hypertensive patients reflecting its contributing role as a cardiovascular risk marker. Consistent with these results, we found that people with essential hypertension had significantly higher levels of Apo B100 and lower levels of Apo A1 than controls. In addition, apo A1 was significantly inversely correlated with both SBP and DBP in essential hypertensive individuals, while Apo B 100 was positively correlated with both. In our study, the Apo B100/Apo A1 ratio was also increased significantly in essential hypertension subjects compared to controls and the ratio of Apo B100/Apo A1 was significantly and positively associated with both SBP and DBP, which is in accordance with Nayak et al. (2016). Similarly, Lee et al. (1986), found higher levels of Apo B100/Apo A1 ratio in hypertensive subjects compared to controls but was statistically insignificant. Even, the severity of atherosclerosis was found to have a strong correlation with serum Apo B in a normolipidemic subgroup, according to the findings of Haidari et al. (2001). After controlling for the impact of gender, age, smoking, and hypertension, Sabino et al. (2008), observed that both the Apo B level and the Apo B/A1 ratio independently linked with peripheral atherosclerosis and brain stroke. The ApoB/ApoA-I ratio is widely acknowledged as a more accurate predictor of cardiovascular risk than other conventional lipid markers (Montali et al., 2015). Therefore, essential hypertensive people with dyslipidemia and an elevated Apo B100/Apo A1 ratio are at an increased risk for the development of cardiovascular disease.

### Conclusions

The present study demonstrated that essential hypertension is characterized by dyslipidemia (increased total cholesterol, TG, LDL, and decreased HDL), alteration in apolipoproteins levels (increased Apo B100 and decreased Apo A1), and their ratio (increased Apo B100/Apo A1 ratio), suggesting that high blood pressure may be responsible for disturbances in lipoprotein



metabolism. Furthermore, the Apo B100/ Apo A1 ratio may be used as a complementary marker for the prediction of the risk of cardiovascular disease in essential hypertension subjects.

Prospects for further research include establishing a causal relationship between dyslipidemia and hypertension; identifying changes in the lipid profile caused by diet, physical activity, medications, or other influences; and determining the relationship of lipid parameters and apolipoproteins with other cardiovascular risk factors.

#### Ethical Approval

Institutional Ethical Committee approval was obtained from the institution (Reference No: IEC/MC/2020/459, dated 08/01/2021).

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ORIGINAL RESEARCH



## Influence of Behavioral and Social Factors on Gastric Cancer Incidence and Mortality



### Authors' Contribution:

- A – Study design;
- B – Data collection;
- C – Statistical analysis;
- D – Data interpretation;
- E – Manuscript preparation;
- F – Literature search;
- G – Funds collection

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### Background and Aim of Study:

### Abstract

The significance of the risk factors, including behavioral and social characteristics of the patients, for the occurrence of stomach cancer is constantly increasing and largely determines the development and outcome of the disease.

The aim of the study: to provide empirical data for the significance of behavioral and social factors on gastric cancer incidence and mortality.

### Material and Methods:

Data from a study of gastric cancer patients (234 men and 144 women) examined at the Heidelberg University Clinic (Germany) were used. Risk factors, gastric cancer survival and mortality, factors of fatal outcome of gastric cancer patients were compared. Multiple binary logistic regression analysis was used to quantitatively assess their influence. To analyze the possible statistical significance between different groups, we used Fisher's exact test and chi-squared test for the relationship between categorical variables and Student's t-test. The significance level (rejecting the null hypothesis) is  $p < 0.05$ .

### Results:

The most common risk factors are lack of physical activity, smoking, accompanying cardiovascular diseases, as well as emotional stress. Unhealthy lifestyle increases the risk by 56.8%. With a lower but significant percentage are overweight and alcohol abuse. We found the presence of emotional stress in 25.3% of patients with stomach cancer. Jobs with primary mental work and high stress level increase the probability of negative outcome. Mainly mental work is associated with about 8 times the risk of death compared to physical work. The presence of stress increases the lethal risk about 3.2 times.

### Conclusions:

Risk factors related to healthy lifestyle of the patients, including mental health, play an important role in the development of stomach cancer. They largely determine the status, disease control, treatment, survival and mortality of gastric cancer patients.

### Keywords:

risk factors, survival and mortality, smoking, stress, physical inactivity, overweight, alcohol abuse

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## Introduction

Malignant diseases, including stomach cancer, are among the biggest health problems nowadays. Stomach cancer is the fifth most common cancer in the world and the third most common cause of death due to cancer. While behavior related risk factors (e.g., smoking, alcohol abuse) were often investigated in previous research (den Hoed & Kuipers, 2016; Dong & Thrift, 2017), we suggest that socio-economic factors can also play an important role and do not have to be neglected in prevention programs. For instance, early research suggest that stress influences the carcinogenic process (Sklar & Anisman, 1981). Further study found that in indigenous populations there is a higher burden of stomach cancer (Arnold et al., 2014). Also ethnic-specific differences were found in an U.S. study (Camargo et al., 2011).

There are several previous studies, which analyze the role of socio-economic factors on the incidents and mortality of gastric cancer (Dong & Thrift, 2017; Kim et al., 2020; Sarkar et al., 2022; Song et al., 2015; Tonelli et al., 1997). However, they are relatively few in number and the results are mainly contradictory to each other. Moreover, they do not look into factors such as job type or stress level on the probability of having gastric cancer or of negative outcome.

Medical and social support factors are important for the quality of life of oncology patients (Nikolov & Georgieva, 2022).

Understanding the role of socio-economic factors on incidence and mortality can contribute improving the health care of groups in the society, which are most prone to have high incidence and high mortality rate.

*The aim of the study.* To provide empirical data for the significance of behavioral and social factors on gastric cancer incidence and mortality. In particular, we focus on the analyses of the role of the factors, which affect the increase of life expectancy and quality of life of stomach cancer patients, as well as we discuss potential mitigation of the negative mental and social impacts of the disease.

## Materials and Methods

In order to address the research questions, we have conducted a retrospective clinical-epidemiological study with 378 people diagnosed with gastric cancer. The study focusses on a comparative analysis of behavioral, socio-medical, epidemiological and psychosocial aspects of gastric cancer. The data were collected at the University Clinic in Heidelberg, Germany, using especially design questionnaire. To create the data set, we have used documents from the University Clinic over a 13-year period, including patient examination reports, pathological examinations, discharge information and other clinical documents. Information on the following variables was collected: health-related behavior and social characteristics of the patients, accompanying diseases, as well as psychosocial context and self-reported opinion about their own health assessed using a standardized questionnaire. The final sample consists of 234 (61.9%) men and 144 (38.1%) women.

The data were analyzed using statistical software IBM SPSS Statistics 25.0 and MedCalc Version 19.6.3. In the first part of the analyzes, we used descriptive statistics to analyze potential differences between patients with different characteristics. After that, the following tests were performed in order to analyze potential statistical significance between the different groups: Fisher's exact test and chi-square test for the relationship between categorical variables and Student's t-test or Mann-Whitney. The level of significance at which the null hypothesis is rejected was  $p < 0.05$ . Additionally, Multiple binary logistic regression analysis was applied to establish the factors for fatal outcome from stomach cancer and quantitative assessment of their influence. Kolmogorov-Smirnov and Shapiro-Wilk test were performed to test the assumption of normal distribution of the metric variables.

## Results

### *Distribution of Potential Risk Factors in Gastric Cancer Patients*

The results of the comparative analysis of the frequency distribution of potential risk factors among the patients are summarized in Table 1. The results suggest that the most common factor is lack of physical activity (79.5%), followed by smoking (53.6%) and accompanying cardiovascular diseases (45.5%). With lower but noticeable frequency are overweight (18.6%) and alcohol abuse (6.7%).

**Table 1**  
*Frequency Distribution of Potential Risk Factors*

Indicators	Patients	
	Person (n)	Percentage (%)
<b>Physical activity</b>		
Yes	77	20.5
No	298	79.5
<b>Smoking</b>		
Yes	200	53.6
No	173	46.4
<b>Cardiovascular diseases</b>		
Yes	142	45.5
No	170	54.5
<b>Unhealthy eating</b>		
Yes	124	33.1
No	251	66.9
<b>Presence of stress*</b>		
Yes	108	28.6
No	270	71.4
<b>Higher education</b>		
Yes	92	24.6
No	282	75.4
<b>Overweight</b>		
Yes	70	18.6
No	306	81.4
<b>Alcohol abuse</b>		
Yes	25	6.7
No	350	93.3

*Note.* \*According to self-reported patient's opinion.



The mean age of the patients was  $M=62.11$  ( $SD=12.71$ ) years, ranging between 24 and 93 years old. A significant gender differences is found only for the presence of accompanying cardiovascular diseases – the relative share in men is statistically significantly greater than that those of women,  $\chi^2(1, N=312)=3.945, p=0.049$  (see Table 2). Among the patients with cardiovascular

diseases were 95 (66.9%) male and 47 (33.1%) female. The results of the analyzes of the further risk factors show no statistically significant relationship between gender and the indicators of physical activity, smoking, unhealthy diet, presence of stress, education, overweight and alcohol abuse.

**Table 2**

*Analysis of the Relationship between Gender and Cardiovascular Disease*

Gender	Absence of cardiovascular diseases		Presence of cardiovascular diseases	
	People (n)	Percentage (%)*	People (n)	Percentage (%)*
Male	95	55.9	95	66.9
Female	75	44.1	47	33.1

*Note.* \*Percentage (%) refers to the relative frequency of each of the gender group within the patients with or without cardiovascular diseases (e.g., 55.9% of the patients without cardiovascular diseases were male).

Concomitant cardiovascular diseases were, as expected, more common in the age groups 60-74 and 75+ years old, while in the two younger groups – 15-44 and 45-59 years old – they were less common. Interestingly, unhealthy eating prevails among the oldest patients (75+ years) and has a significantly smaller relative share in the 45-59 age group. The presence of the self-reported stress dominates among the oldest patients (75+ years) and has a significantly smaller relative share in the age group 15-44 years old. The group of patients between 15 and 44 years old has a significantly higher percentage of graduates than the other age groups.

With regard to their marital status, the study participants were divided into 4 groups: married – 185 people or 48.9%, single – 108 people or 28.6%, divorced – 44 people or 11.6% and widowed – 41 people or 10.8%. Marital status does not correlate with indicators of physical activity, cardiovascular disease, unhealthy diet and presence of stress. A statistically significant relationship between marital status and smoking was found: the widowed and married patients have significantly higher rates of smokers than single patients do. Higher education has a significantly higher relative share of married persons and consequentially a significantly smaller share for unmarried. Overweight and alcohol abuse were significantly more among married persons and significantly less among unmarried persons.

**Factors that Affect the Fatal Outcome**

Just over the half of the patients (51.9%) in the sample were still alive at the time point of the study, 182 (48.1%) were dead. Before comparing the groups of deceased and survived participants with regard to their socio-economic characteristics, we first compared them regarding clinical severity. For this purpose, the tumor stage indicator, known for its objectivity and in formativeness, was used. The results of the performed Fisher-Freeman-Halton exact test show no statistically significant difference in the frequency distribution of patients by the categories of the tumor stage indicator, meaning that the two groups were statistically equal in terms of clinical severity. This is a good prerequisite for correctly performing the subsequent comparisons.

The results comparative analysis of survived and deceased patient groups with regard to various socio-economic characteristics and health-related behavior of the patients show significant differences in age, education, marital status, type of work, smoking and alcohol abuse. The deceased patient group has statistically significantly higher average age, a higher percentage of smokers, university graduates, alcohol abusers, married and persons having a job with mainly mental work. The survived patient group has a statistically significantly lower average age and lower share of non-smokers, are rather persons with secondary or primary education, not abusing alcohol, are divorced or single, and persons with jobs that include mainly physical work. For the rest of the indicators, the difference between the two considered groups is not statistically significant.

The results of a multiple binary regression analysis that analyzed the factors that potentially influence fatal outcome from stomach cancer are summarized in Table A.

Marital status has the greatest influence – the risk of fatal outcome for married compared to not married persons is about 257 times greater. On second place as an indicator is the type of work, with the risk of a fatal outcome being about 27 times greater for those performing primarily mental work compared to those with primarily physical work. Further factors with significant influence are smoking behavior, alcohol abuse and higher education. With borderline significance ( $p<0.10$ ) are the indicators age and unhealthy diet.

In order to consider the combined influence of the studied indicators and eliminate possible confounding factors, we put the variables all together in the regression equation and applied the “Backward conditional” procedure. The achieved percentage of correct answers from the classification table was 86.5. Thus, in the final version of the equation ( $p<0.001$ ), five of the studied indicators remain – marital status, type of work, presence of stress, smoking and age. The obtained results give us reason to claim that, compared to unmarried, widowers have about 70 times higher risk of dead, married – about 47, and divorced – about 7 times. Mainly mental versus



mainly physical work is associated with about 8 times the risk of death. The presence of stress increases the lethal risk about 3.2 times, and smoking – about two times. Smoking is associated with an approximately 2.1-fold increased risk of death, and a 1-year increase in age increases the risk of death by approximately 2.0%.

### Discussion

This study analyses the influence of behavioral and socio-economic factors on gastric cancer incidence and mortality based on a retrospective study.

Firstly, unhealthy behavior impacts the probability for gastric cancer. Smoking is commonly found to be a risk factor for gastric cancer in both our study and previous one (e.g., Dong & Thrift, 2017; Popp et al., 2022). Also, our study confirms that alcohol consumption and abuse increase the risk of gastric cancer. Our study confirms also the role of a healthy lifestyle including healthy eating, smoking cessation, low alcohol consumption and adequate physical activity, which were found to play an important role in cancer prevention also in previous research (e.g., den Hoed & Kuipers, 2016). The role of healthy eating was also analyzed in further previous studies. The results of an early study indicate that “hard grains, food with high sodium-chloride concentration, or surfactants” might favor the gastric carcinoma (Correa et al., 1975). A high intake of salted, pickled or smoked foods, as well as dried fish and meat and refined carbohydrates are thought to significantly increase the risk of developing stomach cancer, while fibre, fresh vegetables and fruit appear to be inversely proportional to the risk. According to healthy stomach cancer prevention programs, proper dietary habits should be implemented from childhood by increasing the intake of vegetables (Compare et al., 2010). This was also observed in our study. Diet and lifestyle, proper nutrition and improving people’s awareness level is vital for early diagnosis and timely treatment of gastric cancer, especially in people with family burden and genetic predisposition (Kim et al., 2020; Yusefi et al., 2018). Our study confirms this dependence. The study highlights therefore the importance of efforts to control the global burden of stomach cancer by reducing alcohol and tobacco use as well as to promote overall a healthier lifestyle. A combination of such treatments with other measures, such as proposed oral treatment (Hoff et al., 1998) or similar approaches can be explored in further studies.

Secondly, low socio-economic status is associated with an increased risk of morbidity and mortality from many diseases. A number of studies have observed associations between gastric cancer incidence and education, occupation, and income as indicators of socioeconomic status. In 36 studies, an increased risk of gastric cancer was observed in the lowest socioeconomic statuses compared to the highest (see meta-analyses by Uthman et al., 2013). Although the association between gastric cancer incidence and income level is evident, it does not reach statistically significant levels. In conclusion, it can be noted that the risk of gastric cancer incidence is higher

in groups with low socio-economic status (Sarkar et al., 2022; Uthman et al., 2013).

Thirdly, in our study, it is suggested that social support and education may influence the development of the disease to some extent. In an early study conducted by Siegrist & Siegrist (1987) with 1,444 patients with gastric cancer, this hypothesis could not be confirmed. Therefore, we provide empirical evidence for the role of these factors.

Asplund et al. (2021) found no prognostic influence for gender or education, which is matched by our study. Results were similar for 3-year disease-specific mortality.

Fourthly, in our study, we hypothesize that compared to office workers, unemployed and physically active individuals have an increased risk of gastric cancer. In the study by Kuwahara et al. (2010), the type of work and education was not associated with the risk of gastric cancer. In a recent study, Sarkar et al. (2022) found that gastric cancer cases more commonly held jobs in unskilled labor (compared to professional occupation). Therefore, we have provided here additional empirical evidence about the relationship between the type of work and the risk of cancer or a negative outcome from it, even though our results do not align completely with the results provided by Sarkar et al. (2022).

According to the data from our study, it is suggested that the survival rate is lower in gastric cancer patients with lower socio-economic status. Looking at 42 other studies on the relationship between survival rates of gastric cancer patients and SOC we observed that most studies consistently also reported that patients with lower SOC had lower survival rates than patients with high SOC (see overview by Kogevinas & Porta, 1997; Tabuchi, 2020). This study has several limitations. The localization of the study is limited to the University Clinic in Heidelberg, Germany, and the sample of study participants by individual groups is not large enough. Nevertheless, there is a definite trend that is obtained in the study.

### Conclusions

The most pronounced risk factor that we found in the conducted study is an unhealthy lifestyle (unhealthy diet and, accordingly, overweight, lack of physical activity), which increases the risk of stomach cancer by 56.8%. Unhealthy lifestyle factors include the systematic use of alcohol, cigarettes and narcotics. In this way, the risk of stomach cancer increases up to 6 times. Therefore, education and promotion of a healthy lifestyle is still a very effective way to prevent gastric cancer and negative outcomes of it.

Secondly, as a risk factor, we can point to the presence of emotional stress, which we found in 25.3% of patients with stomach cancer. Therefore, in addition to physical health, also mental health should be increasingly put on focus of health care. This fact deserves particular attention, as it is likely to increase as technology advances.



### Ethical Approval

The study protocol was consistent with the ethical guidelines of the 1975 Declaration of Helsinki as reflected in a prior approval by the Institution's Human Research Committee.

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**Table A**  
 Ratio of Risks and Studied Potential Factors for Gastric Cancer Mortality

Indicators	Comparison	Multiple binary regression				Backward multiple binary regression			
		OR	95% CI		p	OR	95% CI		p
			Lower bound	Upper bound			Lower bound	Upper bound	
Marital status	Divorced/Single	8.368	1.619	43.255	0.011	6.767	1.216	37.651	0.029
	Married/Single	257.429	51.034	1298.536	<0.001	46.591	7.420	292.552	<0.001
	Widowed/Single	164.889	39.119	695.022	<0.001	69.874	15.221	320.763	<0.001
Type of work	Mostly mental/Mostly physical	26.782	14.163	50.646	<0.001	8.035	3.003	21.498	<0.001
	Mixed/Mostly physical	5.629	3.095	10.238	<0.001	1.702	0.692	4.188	0.247
Presence of stress according to the patient	Yes/No	1.368	0.872	2.145	0.172	3.228	1.341	7.768	0.009
Smoking	Yes/No	2.203	1.453	3.339	<0.001	2.102	0.974	4.535	0.058
Age	Increase by 1 year	1.015	0.999	1.032	0.065	1.023	0.996	1.051	0.097
Gender	Female/Male	0.900	0.594	1.365	0.621	-	-	-	-
Alcohol abuse	Yes/No	14.301	3.321	61.593	<0.001	-	-	-	-
Education	Higher/Secondary or primary	1.922	1.191	3.101	0.007	-	-	-	-
Unhealthy diet	Yes/No	1.459	0.947	2.247	0.087	-	-	-	-
Overweight	Yes/No	1.453	0.862	2.450	0.161	-	-	-	-
Cardiovascular diseases	Yes/No	1.358	0.869	2.124	0.179	-	-	-	-
Physical activity	Yes/No	1.122	0.679	1.855	0.653	-	-	-	-

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**SOCIAL AND  
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SOCIAL AND BEHAVIORAL SCIENCES. Rehabilitation

ORIGINAL RESEARCH



# Inhalation Therapy: An Analysis of Inhalation Technique Errors in Metered-Dose Inhaler and Dry Powder Inhaler Users



Authors' Contribution:

- A – Study design;
- B – Data collection;
- C – Statistical analysis;
- D – Data interpretation;
- E – Manuscript preparation;
- F – Literature search;
- G – Funds collection

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**Background and Aim of Study:**

**Abstract**

Decreased efficacy of metered dose inhaler and dry powder inhalers are associated with errors in inhalational techniques.

The aim of the study: to study the association of errors in the technique for using two types of inhalers with demographic and other variables.

**Material and Methods:**

Five hundred adult patients with respiratory diseases who were currently using an inhaler device were enrolled in this study. Patient's demographics and duration of inhaler therapy and assessment of inhaler technique were recorded by interview and direct observation.

**Results:**

Out of 500 enrolled patients, 465 patients were using the device with wrong technique. Among 465 patients, 188 patients were using metered dose inhaler and 277 patients were using dry powder inhalers. Technical errors were common in both the devices but more common with metered dose inhaler device. Failure to exhale before the inhale through device was most common error with metered dose inhaler (68.6%) and dry powder inhalers (71.4%). Association of errors with female gender is seen in both metered dose inhaler and dry powder inhalers users. Reduction in the numbers of errors is seen with increase in the duration of therapy and regular training on follow-up visits.

**Conclusions:**

Dry powder inhalers and metered dose inhalers are commonly used in management of respiratory patients. Therefore, the errors in using these devices, technique and handling errors are common in both dry powder inhalers and metered dose inhaler users. More error was found in old age, female and short-term users. However regular training on follows up visits can solve this current problem.

**Keywords:**

metered dose inhaler, dry powder inhalers, inhalational technique, technical errors, demographic, respiratory diseases, aerosol therapy

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## Introduction

Respiratory diseases such as asthma, chronic obstructive pulmonary disease (COPD) and post tuberculosis obstructive disease (PTOD) is affecting large population globally. These diseases cause the third most frequent cause of death worldwide (EBSCO, 2020). The abundance presence of beta-adrenergic, cholinergic and glucocorticoid in lungs, which lead to concept evolution of inhalation therapy. The inhalation therapy holds many advantages such as lower dosage needed, fast response and minimum side effect over systemic therapy as in even in pregnancy, hypertension, cardiac diseases and diabetes mellitus they are considered safe. Inhalation therapy is also known as aerosol drug therapy in which special device is used to deliver drug in a form of fine mist particles directly to the lungs, which may use in treating various type of respiratory diseases. The particle ideal size ranges from 1 to 5 microns as smaller particles acts as gas and passes through lungs like gas. Particles travelling speed (travelling very fast or very slow) might damage the walls of the upper airways. The particle hit the target site when moves in right speed. The oral inhalation of medications is the first-line treatment for lung diseases; inhaler technique comprises a set of procedures for drug delivery to the respiratory system (Chorao et al., 2014). The advantages offered by this method are financial affordability, convenience, portability, quick and local action, and negligible systemic side effects (Virchow et al., 2008).

The therapeutic index will be maximized, with direct delivery of drug to the respiratory tract by inhale devices. There are many anti-asthma drugs out there but efficiency depends on selection of right drug, device used and technique used. There are wide range of inhaling devices available in market, selecting the right one is very important, which is done on the bases of disease severity, patient type, and pricing or reimbursement controls (Pritchard & Giles, 2014). There for it is necessary to have a proper study of device, drug and patient education for the success of inhaler.

Metered dose inhalers, dry powder inhalers, and nebulizers are the most common inhaler devices used to administer aerosolized medication in routine respiratory practice (Cochrane et al., 2000; Pritchard et al., 2015). Metered dose inhaler (MDI) is most commonly used inhaler device. When it is activated, it releases fixed amount of drug dose from multidose canister. Some important elements of MDI are protective cover; medicine mixed with surfactant and propellant in canister, which is fitted with valve; device body and mouthpiece for the release of medicine.

Metered dose inhalers are inexpensive, compact, and portable, can be hold multidose. It can have fixed and defined dose (Newman, 2005).

Although after all these advantages MDI does have few disadvantages too such as they are not eco-friendly as chlorofluorocarbon (CFC) causes ozone depletion, patient need good coordination of hand and breath and needs training for hand breath coordination (Tsangarides et al., 2018).

According to Newman et al. (1991), ideal technique to use MDI would be: shake before use, then remove the cap, breath out slowly to functional residual capacity (FRC), wide open the mouth holding the device in between lips in upright position starting with slow breathing and actuate MDI simultaneously, till total lung capacity (TLC) continue inspiration, for 5-10 sec hold breath, at last exhale for next puff, at least wait for a minute, after done washing and rinsing mouth is important.

Dry powder inhaler (DPI) contains medicine in powder form in which particle size is in respirable size and these are present with carriers such as lactose or glucose with which they make loose bound. Separation could happen easily among micro sized individual respirable particles; carriers are needed to decrease cohesive forces in micro sized medicine powder. Patient's inspiratory flow provides all the energy needed to disaggregation (Prime et al., 1997). In 1960s, the DPI was introduced since then there are many types of DPI available in India market some are single dose, some are multidose.

Single dose inhales are Lupihaler, Revolizer, Respihaler, Rotahaler; and some of multidose inhalers are Diskhaler, Turohaler and Multihaler. In multidose inhalers, numbers of doses are inserted in the inhaler already (Atkins, 2005).

Dry powder inhalers have many advantages, as they are portable, easy to carry with you due to their small size. They can be used easily with some training, but they do not need any hand breath coordination. They are ecofriendly because they do not have any cold freon effect as propellant is not required in them.

Despite all these advantages, they do hold few disadvantages too, as they are quite expensive. They are not ideal for acute situations and severe respiratory distress. They also need quite high inspiratory flow rate that is about 60L/min or even more. Lactose might cause some irritation cough mostly in lactose intolerant patients. If not kept in dry area, the humidity might cause powder to aggregate and soften of capsule (Crompton, 1991).

In the opinion of Newman et al. (1991), ideal technique of using DPI is: device assembling, if single, no shaking of the device, slowly exhale to FRC, around the mouth seal it, forcefully and deeply inhale, need to hold the breath for 4 to 8 sec, repeat the process if needed, after finish gargle and rinsing mouth is important.

Inhaler technique comprises a set of procedures for drug delivery to the respiratory system. The technique of oral inhalation of medications is a major factor governing the efficiency of the inhaled medication. Using the proper inhaler technique ensures sufficient drug deposition in the distal airways, optimizing therapeutic effects and reducing side effects (Usmani et al., 2018). Although metered dose inhalers are considered more difficult to use than dry powder inhalers, errors in inhaler technique are very common among COPD and asthma patients in daily real-life practice. Inhaler mishandling is very common in patients with chronic airflow obstruction (Melani et al., 2011).



Using inhalers without imparting adequate education regarding proper technique of their usage may result in suboptimal clinical improvement and wastage of medication.

We evaluated the technique of patients using manually operated inhaler devices, metered dose inhaler and dry powder inhalers to study the association of poor inhaler technique with patient demographics and other variables.

*The aim of the study.* To study the association of errors in the technique for using two types of inhalers with demographic and other variables.

### Materials and Methods

A total of 500 adult patients with respiratory diseases who were currently using at least one inhaler device for at least 1 month were included in this cross-sectional, observational study conducted at Department of Tuberculosis and Chest Diseases, in a tertiary care hospital of North India.

Most commonly used devices metered dose inhaler and dry powder inhalers were assessed in this study.

Use of inhaler therapy for less than a month, lack of attendance of regular control visits, confirmed or

suspected pregnancy, breastfeeding, allergy, sensitivity or intolerance to asthma or COPD therapy, and being on nebulizer therapy were the exclusion criteria of the study.

Demographic details of patients, type and duration of inhaler therapy, and assessment of inhaler technique (correct, incorrect) were recorded.

Inhaler technique was assessed using a protocol described by Melani (2007). This protocol documents the performance of ten essential inhaler technique steps by means of closed dichotomous response options (well performed/poorly performed). All assessments were made by two investigators with ten years of experience in the follow-up of asthma patients. After assessment, all patients were given supplemental instruction on inhaler technique by a health professional, in the form of a demonstration.

### Results

Out of 500 enrolled patients, 465 patients were using the device with wrong technique. Out of these 465 patients, 188 were using metered dose inhaler (Table 1) and 277 were using dry powder inhaler (Table 2).

**Table 1**

*Errors in Inhalation Technique with Metered Dose Inhaler (n=188)*

Inhalation technique	Number of patients who made errors	
	people	percentage
Take off the inhaler cap	16	8.5
Shake the metered dose inhaler before use	79	42.0
Hold the metered dose inhaler in a vertical position	47	25.0
Hold your head in a vertical position	53	28.1
Exhale before use	129	68.6
Put the mouthpiece in your mouth, and close your lips	33	17.5
Press the canister when inhaling slowly	126	67.0
Inhale deeply	91	48.4
Hold your breath for 10 seconds	71	37.7
Exhale and wait for 30-60 seconds before the other puff	32	14.3

**Table 2**

*Errors in Inhalation Technique with Dry Powder Inhaler (n=277)*

Inhalation technique	Number of patients who made errors	
	people	percentage
Pull off the aerolizer cover	19	6.8
Open the mouthpiece of dry powder inhaler	16	5.7
Remove the capsule from the package and put it into the space	47	16.9
Press the buttons on both sides of dry powder inhaler	79	28.5
Hold your head in a vertical position	61	22.0
Turn your head away from dry powder inhaler and exhale	198	71.4
Put the mouthpiece in your mouth, and close your lips	26	9.3
Inhale deeply	119	42.9
Hold your breath for 10 seconds	97	35.0
Dispose of the capsule and put the cover back on the dry powder inhaler	36	12.9

Each step of metered dose inhaler use is observed and documented. Out of 188, 129 patients (68.6%) did not exhale before inhaler use, 126 patients (67.0%) failed to press the canister while inhaling slowly, and 91 patients

(48.4%) did not inhale deeply after pressing canister. 79 patients (42.0%) did not shake the inhaler before use, 71 patients (37.7%) did not hold their breath for 10 seconds, 47 patients (25.0%) failed to hold the inhaler in



vertical position, while 53 patients (28.1%) failed to hold their head in vertical position. 33 patients (17.5%) forgot to close their lips after putting mouthpiece in mouth, 32 patients (14.3%) did not wait before for 30-60 seconds before next inhalation, 16 patients (8.5%) did not take off the inhaler cap.

The most common error while using dry powder inhaler is patient did not exhale before using inhaler like metered dose inhaler users. Out of 277, 198 patients (71.4%) did not exhale before the use of inhaler, 119 patients (42.9%) fail to inhale deeply, and 97 patients (35.0%) did not hold the breath for 10 seconds. The most uncommon error was, not removing cap of inhaler like in metered dose inhaler users.

It was observed dry powder inhalers is the most commonly used device as shown by other studies (Castel-Branco et al., 2017; Chorao et al., 2014; Melani et al., 2011). Poor inhaler technique and device handling is common in both metered dose inhaler and dry powder inhalers users. That metered dose inhalers require a good

ability of hand-lung coordination and is therefore considered inherently more difficult to use than dry powder inhalers (Pothirat et al., 2015; Rootmensen et al., 2010).

Therefore, errors related to device handling were common among metered dose inhaler users than among dry powder inhalers users. Failure to exhale before using the metered dose inhaler is the most common error, followed by lack of coordination and failure to inhale deeply.

In dry powder, inhaler users the most common error is to exhale before using dry powder inhalers, followed by failure to inhale deeply and failure to hold breath for 10 seconds.

These errors are more common with female gender as study shows that the errors in using the inhaler devices both metered dose inhaler and dry powder inhalers are more common in females. These errors are reduced with increasing duration of therapy and regular training. (Table 3).

**Table 3**  
*Correlation of Errors with Various Parameters*

Parameters	Age of patient (Mean, years)	Gender of patients		Duration of therapy (Mean, years)	Regular training on every visit
		Male	Female		
<b>Take off the inhaler cap</b>					
Incorrect use	61	11.9	88.1	1.2	7.9
Correct use	54	59.1	38.9	5.8	68.9
P-value	>0.001	<0.001		<0.001	<0.001
<b>Hold the metered dose inhaler in a vertical position</b>					
Incorrect use	65	27.8	72.2	1.8	9.1
Correct use	52	36.3	63.7	6.1	79.6
P-value	>0.001	<0.001		<0.001	<0.001
<b>Hold your head in a vertical position</b>					
Incorrect use	62	20.4	79.6	2.1	6.7
Correct use	56	32.7	57.3	7.3	76.9
P-value	>0.005	<0.001		<0.001	<0.001

Reduction in the numbers of errors is seen with increase in the duration of therapy and regular training on follow-up visits.

### Discussion

Not many researches have been conducted in India to study the errors in inhalation techniques of metered dose inhaler and dry powder inhalers users.

It was observed that inhaler technique errors are very common and regular training can significantly reduce the disease burden. Errors were more common with dry powder inhalers than with metered dose inhaler. Although, the study done by Nainwal et al. (2022), DPI are considered, more advanced and more advantageous due to its stability and ability to deliver a high dose of the drug to the lungs. Inability to exhale properly before use is the most common error followed by error in shaking the device before use.

Similar results were observed in other studies. In a study conducted by Castel-Branco et al. (2017), similar results were obtained. The study involved 67 patients from four community pharmacies. In the dry powder inhalers techniques, the most frequent errors were “no previous

forced expiration” (46=61.3%) and “no 10 second apnea after inhalation” (51=68.0%); in the 16p metered dose inhalers techniques common errors were “lack of hand-lung coordination” (7=43.8%), “no previous forced exhalation” (8=50.0%), and “no apnea after inhalation” (10=62.5%). This is similar to observations made in our study.

In another study conducted by Melani et al. (2011), the errors in technique of inhalation was evaluated in trained patient. Independently of the inhaler, they found a strong association between inhaler misuse and older age (p=0.008), lower schooling (p=0.001) and lack of instruction received for inhaler technique by health caregivers (p<0.001). Inhaler misuse was associated with increased risk of hospitalization (p=0.001), emergency room visits (p<0.001), courses of oral steroids (p<0.001) and antimicrobials (p<0.001) and poor disease control evaluated as an Asthma Control Test (ACT) score for the asthmatics (p<0.0001) and the whole population (p<0.0001). This was similar to our study, where we observed older age and lesser training was associated with more errors in inhalation technique.



Chorao et al. (2014) observed that patients over 60 years vs. younger age ( $p=0.002$ ) and COPD vs. asthma patients ( $p=0.016$ ) required more attempts to ensure correct use. 41.0% of the study participants chose one of the devices they already used as the most preferred inhaler.

In another study conducted on COPD patients of mean age  $70.9\pm 8.3$  years using metered-dose inhaler by Choomuang et al. (2022). It was observed that only 16% ( $p<0.001$ ) was using correct technique, 25% ( $p<0.026$ ) was having correct flow and only 7% ( $p<0.001$ ) was using both correct technique and correct flow but after one month of training 34% ( $p<0.001$ ) was using correct technique, 37% ( $p<0.026$ ) was having correct flow and only 22% ( $p<0.001$ ) was using both correct technique and correct flow.

Thus, incorrect use of inhaler is a prevalent problem across countries. The problem can be significantly reduced with proper training and retraining.

### Conclusions

It is observed that errors in using the device and handling are common in both dry powder inhalers and metered dose inhaler users. But in old age, female and short-term users more errors were found compared to young age, male and long-term users. The error associated with both users are mainly with handling the devices, technique of using the devices and safekeeping of the devices. To overcome problems related to these devices people need more and proper regular training of handling and using these devices. Patient needs training in how to keep devices clean and use it safely. Patient needs more follow up visits in which proper training could be provided.

### Ethical Approval

The study protocol was consistent with the ethical guidelines of the 1975 Declaration of Helsinki as reflected in a prior approval by the Institution's Human Research Committee.

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LETTER TO THE EDITOR





## LETTERS TO THE EDITOR

### LETTER TO THE EDITOR



# Integrating Meditation Practice into Thanatophobia Therapy



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#### Background and Aim of Study:

#### Abstract

We explore the potential effectiveness of incorporating maranassati meditation into therapeutic practices, highlighting its ability to mitigate thanatophobia and improve psychological well-being. Drawing upon Buddhist psychological perspectives, maranassati emphasizes the contemplation of mortality, impermanence, and interconnectedness.

The aim of the study: to integrate Buddhist meditative practice into thanatophobia therapy.

This article presents research evidence from real-world scenarios involving individuals with coronary artery disease, cancer patients, and the elderly. The initial findings provide a solid foundation, reinforcing the efficacy of mindfulness-based therapies in reducing death anxiety and improving psychological well-being. The proposed approach offers valuable insights for counselors and therapists in assisting future clients in cultivating a positive outlook on death, thereby alleviating fear and anxiety associated with mortality.

#### Keywords:

meditation, contemplating, cognitive therapy, thanatophobia, maranassati, Buddhist practice

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### Dear Editor,

While contemporary science studies consciousness, social interactions, and emotional and moral responses in the study of the dying process, Buddhism simplifies them for introspection and reflection (MN 9, Trans. by Sujato, n. d.). Buddhist practice, dating back 2,600 years, unveils an understanding of demise encompassing both physical and mental aspects.

*“What is death? The passing away, perishing, disintegration, demise, mortality, death, decease, breaking up of the aggregates, laying to rest of the corpse, and cutting off of the life faculty of the various sentient beings in the various orders of sentient beings. This is called death.”* (Sammāditthi Sutta (M i.46).

It was only in the last quarter of the 20th century that science has reevaluated the concept of death as the cessation of vital functions, prompting exploration in literature and biomedical ethics.

Black (1977/2014) provides an ethical and practical approach to understanding the dying process, focusing on the heart, lungs, and brain. However, traditional vital signs such as circulation and respiration challenge the determination of death in modern medicine. Black suggests considering additional connotations and conflicting meanings of the dying process in light of societal pressures. In line with this, Hoffman (1979) presents three perspectives on the meaning of death, emphasizing brain function, brain and heart/lung function, and the value of artificial means. While clinical death primarily concerns biological function, it often overlooks emotional reactions and moral judgments. Hoffman's ethical implications underscore the importance of nurturing relationships and valuing human life. Biomedical ethics support ethical choices amidst ongoing debates on death.



### **Thanatophobia**

Since 1969, Colett and Lester's research has brought attention to the fear of mortality in academia (Colett & Lester, 1969/2012). Their study aimed to differentiate between death distress and the fear of the dying process, constructing measurements for death fears. The study entailed 25 undergraduate females who completed a questionnaire assessing different types of fear related to death. Results revealed that the greatest fear was associated with one's own demise, followed by the fear of one's own dying process. Interestingly, the least fear was linked to others' dying, indicating that personal experience has a vital influence. Despite the small sample size, the study sheds light on an important and understudied topic, paving the way for future research on a larger scale. Newly released data from Statista (2023) spotlights the prevalence of fear of death among a sample of 1,220 American respondents, with a majority (68%) reporting some level of fear. Notably, in a recent study conducted by Anālayo et al. (2022), a rigorous randomized controlled trial examined the impact of mindfulness practices on the fear of dying and death. The findings demonstrated that engaging in mindfulness and contemplative practices effectively reduced the fear related to one's own impending death and the death of others. More notably, these practices had the intriguing effect of both heightening the fear of experiencing others' dying and fostering the cultivation of mindfulness and self-compassion.

### **Meditation Practice**

Maranassati, the contemplation on death in early Buddhism, is integral to Vipassanā meditation. Gautama Buddha draw attention to the benefits of mindfulness of death, including peaceful living and the cessation of defilements. Detailed instructions on cultivating awareness of the dying process are found in the Satipatthānasutta (MN 10, Trans. by Sujato, n. d.), which guides the four foundations of mindfulness. Contemplating death involves reflecting on the impermanence and ending of life, with corpses, skeletons, and bones serving as objects for contemplation. In contemporary discussions on maranassati, Allen and Catherine (2017) pay attention to the spiritual urgency known as samvega, which facilitates successful meditation on death. More than 2,600 years ago, the Buddha-to-be renounced worldly comforts in his quest to transcend the cyclical nature of existence characterized by birth, aging, illness, and death. Presently, the continuous cycle of samsara continues to impact all sentient beings, eliciting varying degrees of death-related apprehension within the human psyche.

The dying process extends beyond external locations such as morgues and cemeteries, encompassing biological and physiological changes occurring within our bodies and minds continuously. Processes like digestion, waste elimination, and the growth and death of skin cells influence our thoughts and emotions. Understanding the impermanence inherent in these momentary dying processes can alleviate fears related to the final passing of the physical body. However, the karmic actions we have undertaken throughout our lives

continue to occupy our thoughts until our last breath. While the presence of loved ones during the dying process can be beneficial, learning to confront death alone holds value in attaining inner peace.

Life entails uncertainty and choices, and the fear of death and uncertainties endure. Consequently, the integration of maranassati in therapeutic practices becomes essential for addressing latent fears and living a meaningful life.

### **Mindfulness-based Cognitive Therapy**

The effect of Mindfulness-Based Cognitive Therapy (MBCT) in alleviating death anxiety among diverse populations has been explored in several studies. Ghadampour et al. (2018) conducted a study involving 30 women diagnosed with coronary artery disease. They used a semi-experimental design, randomly assigning participants to either an experimental or control group. The experimental group received eight 2-hour sessions of MBCT training. The results showed a significant decrease in death anxiety levels after the MBCT intervention, and these positive effects were maintained during the follow-up phase.

In a similar vein, Nabipour et al. (2018) examined the efficacy of MBCT in mitigating suicidal ideation and death anxiety in cancer patients. They selected 30 cancer patients and divided them into experimental and control groups using a pre-test and post-test design. The experiment revealed a significant reduction in both suicidal thoughts and death anxiety following the MBCT group therapy sessions, indicating the outcome of this intervention in addressing psychological distress associated with cancer.

Moreover, Pirkalani et al. (2019) investigated the effectiveness of MBCT in addressing depression, death anxiety, and life expectancy among elderly women. They recruited 30 elderly women from specific districts in Tehran using a random stratified sampling method. The experimental group participated in 10 group-based MBCT sessions. The results indicated a significant difference in life expectancy, depression, and death anxiety scores between the experimental and control groups.

Overall, the reviewed studies consistently illustrate the efficacy of MBCT in decreasing death anxiety in individuals with chronic illnesses. The long-term effects of MBCT beyond the intervention periods highlight its value as a sustainable therapeutic approach, offering ongoing benefits to individuals with thanatophobia and aiming to enhance their overall quality of life.

### **Attitudes towards Death in the Elderly**

Among institutionalized elderly individuals in Egypt (Fadila et al., 2018), approach acceptance was identified as the most prevalent attitude towards death, followed by escape acceptance and fear of death. The researchers discovered moderate correlations between different attitudes towards death and variables such as loneliness, life satisfaction, health status, and comorbidities. Accordingly, they suggested to promote social relationships and engage in periodic discussions about death with elderly individuals and their families.

With regard to therapeutic practices, narrative therapy (Nozari et al., 2019) has shown promise in alleviating



distress and uncertainties associated with fear of death. Narrative group therapy (NGT) exhibited positive effects on aging perceptions and death anxiety in older adults. NGT therein proved beneficial in mitigating death anxiety, and these benefits were sustained over time. Meanwhile, another study by Golestanifar and DashtBozorgi (2021) demonstrated the effectiveness of acceptance and commitment therapy (ACT) in reducing depressive symptoms and improving psychological well-being among elderly individuals with nonclinical depression. Participants who received 10 sessions of ACT experienced a significant reduction in depression levels and showed improvements in psychological health and life expectancy.

Particularly in the work of Menekli and Dogan (2021), religious attitudes were found to be inversely associated with death anxiety and positively linked to attitudes towards death among elderly patients. Higher levels of religious attitudes correlated with lower levels of death anxiety and more positive perspectives on mortality. Nurses and other healthcare professionals were encouraged to consider the impact of religious beliefs when addressing death anxiety and fostering positive attitudes towards death in intensive care patients.

Collectively, these studies provide valuable insights into interventions and factors related to the psychological well-being, attitudes towards death, and anxiety experienced by elderly individuals. They underscore the potential benefits of interventions such as narrative therapy, acceptance and commitment therapy, and the influence of religious beliefs in improving the psychological well-being and attitudes towards death among the elderly. Healthcare professionals can leverage these therapeutic practices to reduce depressive symptoms, anxiety, and negative attitudes associated with aging and mortality in older adults.

#### **Integration of Maranassati into Therapy: A Proposed Approach**

Considering the on-going body of research discussed, integrating maranassati into therapy promises a comprehensive approach to addressing Thanatophobia and fostering psychological well-being. The practice of Maranassati, as highlighted by Anālayo (2019), brings a deep understanding of transience and cultivates acceptance, reduced fear, improved well-being, and spiritual development. In addition, Moon (2019) also emphasized the positive effects of mindfulness of death on life, particularly in an adolescent population.

#### **Conclusions**

The integration of maranassati meditation in therapy holds great significance in addressing Thanatophobia, as it provides a comprehensive perspective. Through dedicated practice, both meditation practitioners and individuals struggling with thanatophobia can effectively navigate anxieties related to mortality and cultivate a deep understanding of impermanence and equanimity. By embracing the benefits of maranassati in therapeutic settings, therapists and counselors have the opportunity to enhance the psychological well-being and overall quality of life for those facing this paralyzing fear. This

integration brings forth new insights and interventions to tackle Thanatophobia, offering hope and potential advancements in the field.

#### **Ethical Approval**

The study protocol was consistent with the ethical guidelines of the 1975 Declaration of Helsinki as reflected in a prior approval by the Institution's Human Research Committee.

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