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EDITORIAL

The interconnection of tertiary care with the community in the implementation of the new guidelines for diabetes mellitus

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The management of diabetes mellitus (DM) has long been one of the key indicators of the effectiveness of health systems worldwide. Contemporary challenges and the rapid evolution of biomedical technology require the creation of a continuous and seamless care network, extending from the specialized environment of tertiary health care to everyday clinical practice in the community. At the center of this organized transition is the nurse, who is called upon to evolve from a simple provider of clinical care into a coordinator and educator of the patient.

The updated guidelines of the Hellenic Diabetes Association (HDA) and the American Diabetes Association (ADA)[1,2] for 2026 introduce a radical change in the philosophy of disease management. Diabetes management is now definitively shifting from simple glycemic control to early, holistic cardiorenal protection and the universal integration of digital technology. The use of continuous glucose monitoring (CGM) systems and automated insulin delivery (AID) devices is now recommended immediately at diagnosis, both for type 1 diabetes mellitus (T1DM) and for adults with type 2 diabetes mellitus (T2DM) receiving intensified insulin therapy. At the same time, new drug classes, such as dual GIP/GLP-1 receptor agonists, are reshaping therapeutic regimens while also focusing on obesity management. The successful translation of these complex guidelines into tangible clinical benefit requires bridging the existing gap between hospital care and the community.

In the tertiary hospital setting, the nurse is called upon to manage acute life-threatening complications and to control the glycemia of inpatients according to strict safety protocols. This period of hospitalization constitutes an ideal window of opportunity for initiating structured therapeutic education.

The patient's familiarization with new injectable therapies and digital technology begins at the hospital bedside. However, patient discharge constitutes an extremely vulnerable transitional care phase. According to the international literature, the absence of organized coordination at discharge sharply increases the rates of glycemic dysregulation and early hospital readmission, placing an additional burden on the health system[3,4].

At this point, the primary health care (PHC) and community nurse assumes responsibility for long-term support and the maintenance of therapeutic adherence. The nurse's role includes home monitoring, remote assessment of digital glucose data (Time in Range), early recognition of warning signs, and prevention of chronic complications, with emphasis on regular examination and care of the diabetic foot. In addition, the community nurse is the professional who addresses the patient's long-term psychological burden (diabetes distress), providing specialized counseling support that strengthens disease self-management.

For the effective implementation of this modern model of care, specific health policy measures must be adopted. The institutionalization of structures and their staffing with specialized diabetes nurses (Diabetes Nurse Specialists) are required, as is the creation of a unified digital health record that will ensure the uninterrupted flow of clinical information from the hospital to the community. Systematic investment in the continuing education of nursing staff in new technologies is the only path toward reducing national health costs and, above all, toward substantially improving the quality of life of people with diabetes mellitus.

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RESEARCH ARTICLE

Grief Management and Death Education: A Study of Families of Potential Organ Donors and Recipients

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ABSTRACT

Introduction: Chronic kidney disease (CKD) contributes significantly to global morbidity and mortality. Even in its early stages, it increases the risk of death, cardiovascular events, cerebrovascular disorders, hospitalization, reduced health-related quality of life, anxiety, depression, fear of death and suicidal ideation. Poverty and other socioeconomic disadvantages, such as unemployment or poor housing conditions, were determining factors in lack of treatment or discontinuation of care, because families could not cope with this considerable burden.

Aim: The purpose of this study is to investigate families of Potential Organ Donors and Recipients, who are confronted daily with experiences of death, grief and fear of death, as well as their attitudes toward death, in order to answer the question of whether they need further education on death-related issues. At the same time, the demographic determinants that affect the quality-of-life level of these families were examined.

Methods: A cross-sectional interventional study was conducted in a sample of 50 families (30 women and 20 men) of Potential Organ Donors and Recipients. The Death Attitude Profile-Revised (DAP-R) instrument was used to assess the Death Profile, while factor analysis was used to analyze and create auxiliary variables, with Bonferroni correction applied to control for multiple comparisons among variables.

Results: Analysis of the data showed that participants mainly adopted attitudes of fear (M=3.43, SD=1.68) and avoidance (M=3.31, SD=1.30) toward death. At the same time, better physical health tended to be associated with the adoption of avoidance, neutral acceptance, approach acceptance and escape acceptance behaviors toward death, whereas better mental health was associated with escape acceptance toward death. In addition, graduates of compulsory education (M=31.87, SD=8.63) had significantly poorer quality of life (95% CI: [-23.3, -6.01], p=0.000) than graduates of higher education (M=46.55, SD=7.40). At the same time, graduates of compulsory education (M=2.71, SD=1.29) tended to adopt death-avoidance behaviors to a lesser extent (95% CI: [-3.59, -0.36], p=0.010) than holders of a postgraduate or doctoral degree (M=4.68, SD=0.91). Finally, graduates of compulsory education (M=2.08, SD=1.00) adopted approach-acceptance behaviors to a lesser extent (95% CI: [-2.86, -0.18], p=0.013) than graduates of higher education (M=3.61, SD=1.29).

Conclusions: This study addresses an extremely sensitive issue that is often treated as taboo, attempting to contribute to a better understanding of views surrounding death among families of individuals who either suffer from chronic diseases and rely on organ transplantation or are potential donors. In any case, practical support and more comprehensive information for caregivers/families are expected to have positive consequences for the attitudes they develop toward death, although further research is necessary.

Keywords: Death Profile, Family, Chronic Renal Failure (CRF), Fear, Care

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INTRODUCTION

Worldwide, chronic kidney disease (CKD) affects approximately 500 million people, almost 80% of whom live in low- and middle-income countries (LMICs). In addition, approximately 3 million people with end-stage kidney disease (ESKD) receive renal replacement therapy (RRT), either through hemodialysis or transplantation.(1-3) At the same time, increasing pressure is being placed on healthcare systems by the continuously growing elderly population. In the USA specifically, approximately 40% of the population aged >60 years has CKD,(4) and these numbers are expected to increase.(5)

A considerable amount is now known about the pathophysiological and therapeutic trajectories of CKD, as well as the associated symptom burden experienced by patients. According to more recent studies, there is increasing interest in the way complex long-term conditions require patients and their families (their caregivers) to invest in self-care and self-management of their disease.(6-11) At the same time, the experience of families (caregivers) in managing the disease and its treatment, including their choices and expectations, is influenced by structural, relational and resilience-related factors, the interactions among which remain insufficiently understood.(12)

In the case of end-stage chronic renal failure, transplantation is the only treatment option, with a positive effect on the patient and his or her family.(13) Living-donor kidney transplantation includes aspects of physical and emotional care for all those involved in the process, taking into account possible and experienced adjustments, with spirituality considered a contributing factor. Spirituality and religiosity improve resilience in managing stressful situations and chronic illness,(14-16) while courage, coping ability and spirituality, as a representation of death as a passage, have been found to have a positive effect on patients.(17, 18)

Living-donor transplantation contributes to reducing waiting-list time and increasing patient survival, while also promoting quality of life and family relationships.(19) At the same time, however, it is a time-consuming process because it involves ethical issues and specific assessments of the recipient and the donor. These factors can affect the highly important family system, since the family faces dilemmas both regarding the possibility of organ removal from a healthy family member and regarding surgical risk.(20, 21) Therefore, it is important to understand the expectations of the individuals involved in donation and in the recipient's acceptance of the organ, as fundamental mutual family support that enables transplantation.(20)

As mentioned above, organ donation can generate a negative feeling known as «fear of death,» «death anxiety» or «death distress.» In psychoanalysis and clinical psychology, the term death distress deals with a theoretical reality concerning the death drive. The focus of this distress (death) is no longer clearly identified by the individual, because it is pushed back into the subconscious. It can lead to more or less intense distress and may be displaced onto other instinctive impulses, such as phobia, or onto anxiety about the dissolution of the body. Death anxiety, however, is a term that refers to a more psychological emotional state, corresponding to fear of, or a more or less well-recognized object (death). It is used in differential psychology or social psychology because it allows self-assessment and therefore the quantification of comparisons between subjects.(22) The term fear of death refers to an emotion connected with a clearly identified theme. It concerns only people who have become aware of the origin of death distress and does not involve unconscious mechanisms.

Through organ donation, a person may attempt to «tame» a frightening phenomenon associated with the unknown aspects of death. However, the negative feelings that accompany it may not be fully resolved, and death distress remains present to varying degrees depending on the individual. One of the causes of death distress lies in fear of the end itself. This distress, which is less intense and more or less conscious among individuals, can be restrained or counterbalanced by adherence to social prohibitions known as taboos or by controlling fear through magical thinking and superstitious rituals.

Taboos are defined by Sabri et al. (2010)(23) as «a cultural production that is sacred (religious) or magical (profane), which dictates prohibited behaviors and/or conversations, is associated with individuals with emotional ambivalence, and whose violation leads to sanctions because of the contagious nature of taboos.» The taboo of death leads to avoidance of discussions about organ donation, in the hope of complying with rules of social and moral integrity.(24, 25) At the same time, adherence to the taboo of death and superstition constitute two competing psychological mechanisms triggered by death anxiety, with speech being transformed into a magical act that can release people from their death distress.(26)

These difficulties place a significant burden on those directly responsible for care, especially family members («caregiver/family burden»). The family burden increases significantly, as functional and cognitive impairments imposed by chronic illness limit the patient's ability to care for himself or herself. Additional factors related to the family (caregiver) burden include the relationship between the caregiver (and their career) and the patient, behavioral and psychological symptoms presented by the patient, gender and adverse life events. This is a multifactorial role, and the interdependence of these factors must be assessed in order to determine the impact of the family burden.

The association of CKD with a variety of comorbid

conditions, which compromise patients' overall functional and cognitive capacity and add an increasing burden to the family, presents particular challenges. Among patients aged 65 years and older who began hemodialysis, 40% had five or more comorbidities (USRDS, 2007). In addition, they were often impaired in ways that directly affected hemodialysis treatment (vision problems, inability to drive, difficulty with arousal, mood disorders, cognitive impairment).(27, 28) In particular, moderate to severe cognitive impairment among patients over 55 years of age undergoing hemodialysis was observed at a rate of 70%.(27)

Alongside the physical burden of performing peritoneal dialysis (PD) and administering medication, families are also responsible for transporting their loved ones to clinic or hospital appointments, and they are responsible for providing special diets and nutritional supplements. In addition, they bear the emotional and psychological burden of having a loved one with a chronic illness.

The caregiving burden for a hemodialysis patient presents specific problems, depending on whether the patient is maintained on in-center or home hemodialysis, as difficulties in ensuring transportation to the dialysis center must also be taken into account. Recovery time after an HD session is also an important issue.(29) On average, HD patients require 6 hours to recover after a treatment, with older patients often reporting difficulties until the following day. With regard to home dialysis, although some home dialysis (PD) regimens are ostensibly self-care therapies, caregivers often assume some, if not total, responsibility for managing dialysis.(30) Stress, fatigue, depression, deterioration of family relationships, social isolation, anxiety and fear of death may occur when caregivers undertake home dialysis for adult patients or children.(19, 30-32) Consequently, a stronger negative impact is likely to be observed on the emotional and social aspects of caregivers' and families' lives.(33)

The subject of the present study is the study of families of Potential Organ Donors and Recipients, who are confronted daily with experiences of death, grief and fear of death. The aim is to determine their attitude toward death, the degree of acceptance of the possibility of death, and any need for further education on this topic. At the same time, demographic determinants that may affect the quality-of-life level of these families are investigated.

MATERIAL AND METHOD

Study Design

For the purpose of the study, a cross-sectional interventional follow-up study was conducted, examining, at a specific point in time, families of Potential Organ Donors and Recipients with regard to their experiences of death, grief and fear of death, their attitudes toward death, whether they need more education, and at the same time investigating the demographic determinants that affect the quality-of-life level of the families of Potential Organ Donors and Recipients.

Nursing staff are usually the first choice to whom families turn for issues related to the donation of organs from a relative, and this relationship may be decisive in reaching the final decision. Therefore, it was considered important to determine the family's attitude and to attempt to improve it.

To collect the necessary information, the Death Attitude Profile-Revised (DAP-R) questionnaire was used. It was developed by the research team of Gesser, Wong and Reker in 1987-1988 and examines the attitudes of healthcare professionals toward death. For its translation into Greek, the translation procedure recommended by the Trust Scientific Advisory Committee (SAC) was followed (double back-translation), with cultural adaptation and validation of the questionnaire. After the DAP-R was validated and translated by Malliarou and colleagues (2011), the reliability, validity and structural testing (factor analysis) of the questionnaire were assessed with psychometric tools.(34)

Data Collection

To achieve the objectives of the study, a sample of 50 families of potential organ donors and recipients was recruited from hospitals in Larnaca and Nicosia, following a personal visit to the hospitals and an explanation of the purpose of the questionnaire. Difficulties in obtaining objective answers from the family arise from identifying the center of decision-making (patriarchal or matriarchal family), the family's educational level, and other ethical, religious and cultural barriers.

Overall, 30 (60%) women and 20 (40%) men participated in the study; 48% (n=24) were older than 65 years, while 30% (n=15) were aged 50 to 64 years. Lower participation was observed among individuals aged 20 to 34 years (n=7, 14%) and 35 to 49 years (n=4, 8%). In addition, the overwhelming majority of participants were of Cypriot origin (n=47, 94%), while 4% (n=2) were Greek and 2% (n=1) were of another nationality. A total of 38% (n=19) of participants were graduates of compulsory education, 30% (n=15) were graduates of secondary education, 20% (n=10) were graduates of higher education, and 12% (n=6) held a master's or doctoral degree.

No ethical or legal problems are expected to arise during the conduct of this study, as the data come from questionnaires completed voluntarily and anonymously by the families of Potential Organ Donors and Recipients. The study is being conducted in accordance with the Bioethics Committee, the Scientific Committee for the Promotion of Research of the Ministry of Health, and the Personal Data Protection Committee.

RESULTS

The resulting data were analyzed using the IBM SPSS 21 statistical analysis program, while the extracted information was categorized according to the corresponding category of interest.

Exploratory factor analysis and reliability analysis

Initially, the suitability of the data for factor analysis was examined using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy(35, 36) and Bartlett's test of sphericity(37). The KMO index ranges from 0 to 1, with values above 0.50 considered satisfactory for analysis, while suitability according to Bartlett's test of sphericity is determined by the significance of the results ($p<.05$).(38)

For factor extraction, the Principal Component Analysis method was selected(39), in order to simplify the factor structure of a group of items or, alternatively, the high item loadings on a factor.(40) In addition, the Kaiser criterion (eigenvalue greater than 1) and the cumulative/total percentage of explained variance were used.

The rotation procedure maximizes high loadings and minimizes low item loadings, leading to a more interpretable and simplified solution. In this study, the Varimax orthogonal rotation method was selected.(39) In addition, after the completion and evaluation of the analysis, loadings that could not be assigned to any other factor, according to the factor loadings, were examined in order to decide whether the corresponding items should be rejected. Loadings greater than 0.7 are considered significant. Finally, the reliability of the extracted factors was examined using Cronbach's alpha reliability coefficient, with values >0.7 considered acceptable.

According to the results, a problem was identified with questions 8, 22 and 31 of the dimensions concerning approach acceptance of death (loadings below 0.5), and for this reason these questions were excluded from the calculation of the approach-acceptance dimension. In addition, factor analysis was found to be statistically significant (KMO>0.6, Bartlett's $p<0.01$), while the reliability of the five dimensions of the instrument was considered very satisfactory (Cronbach's alpha>0.7 in all cases).

Descriptive results for attitudes toward death (death profile)

Based on the participants' answers to the items of the instrument assessing attitudes toward death, scores were calculated for the five dimensions of the instrument. The dimensions can take values from 1 to 7, with a higher mean value indicating greater adoption of the corresponding attitude.

Data analysis showed that participants primarily adopted attitudes of fear (M=3.43, SD=1.68) and avoidance (M=3.31, SD=1.30) toward death, while to a lesser degree they adopted attitudes of escape acceptance (M=2.90, SD=1.55), neutral acceptance (M=2.67, SD=1.27) or approach acceptance (M=2.65, SD=1.26) of death.

Association between attitudes toward death and quality of life

In addition, physical health-related quality was found to be positively associated, at a significance level of alpha=0.05, with death avoidance ($r=0.371$, $p=0.014<0.05$), neutral acceptance ($r=0.314$, $p=0.030<0.05$), approach acceptance ($r=0.433$, $p=0.002<0.05$) and escape acceptance ($r=0.423$, $p=0.003<0.05$), while mental health-related quality was positively associated, at a significance level of alpha=0.10, with escape acceptance ($r=0.261$, $p=0.076<0.10$). These results indicate that better physical health is associated with the adoption of avoidance, neutral acceptance, approach acceptance and escape acceptance behaviors toward death. Conversely, better mental health is associated with the adoption of escape acceptance toward death.

Comparisons by gender

Next, the possible differentiation of quality-of-life and death-attitude outcomes by gender was investigated. For this purpose, an independent-samples t-test was used; no statistically significant differentiation in quality-of-life and death-attitude outcomes by gender was found at a significance level of alpha=0.05 (Table 1).

Table 1. Results of the t-test for the dimensions of attitudes toward death and quality of life by gender

	Gender				t	p
	Men		Women			
	M	SD	M	SD		
Fear of death	3.65	1.85	3.29	1.59	0.729	0.475
Death avoidance	3.26	1.47	3.35	1.20	-0.214	0.832
Neutral acceptance	2.53	1.17	2.75	1.33	-0.579	0.565
Approach acceptance	2.85	1.43	2.53	1.15	0.838	0.406
Escape acceptance	2.99	1.67	2.97	1.51	0.035	0.972
PCS-12	38.40	10.84	37.38	9.06	0.362	0.719
MCS-12	39.04	11.37	36.99	13.40	0.562	0.577

Comparisons by age

Subsequently, the possible differentiation of quality-of-life and death-attitude outcomes by age was examined as the next analysis category, using one-way ANOVA for more than two independent samples. A statistically significant differentiation of quality-of-life outcomes by age group was observed at a significance level of alpha=0.05. More specifically, physical health-related quality of life (F=17.81, p=0.000<0.05) and mental health-related quality of life (F=7.717, p=0.001<0.05) differed significantly by age. Bonferroni's multiple-comparison test was used to investigate the existence of statistically significant differences among age groups for each dimension of quality of life.

The test results showed that individuals aged up to 49 years (M=49.3, SD=5.0) had significantly better quality of life (95% CI: [5.13, 19.87], p=0.000<0.05) than individuals aged 50-64 years (M=36.8, SD=8.56). Similarly, individuals aged up to 49 years (M=49.3, SD=5.0) had significantly better quality of life (95% CI: [9.41, 22.92], p=0.000<0.05) than individuals aged 65 years and over (M=33.13, SD=7.67). In contrast, no significant difference was observed between individuals aged 50-64 years and those aged 65 years and over (95% CI: [-2.45, 9.78], p=0.429>0.05). Similarly, individuals aged up to 49 years (M=49.41, SD=9.85) had significantly better quality of life (95% CI: [3.23, 125.15], p=0.007<0.05) than individuals aged 50-64 years (M=35.22, SD=11.67). In addition, individuals aged up to 49 years (M=49.41, SD=5.0) had significantly better quality of life (95% CI: [5.233, 25.33], p=0.001<0.05) than individuals aged 65 years and over (M=34.12, SD=11.29). No significant difference was observed between individuals aged 50-64 years and those aged 65 years and over (95% CI: [-10.17, 7.99], p=0.999).

With regard to the dimensions of attitudes toward death, no significant difference emerged by age group for any form of attitude. However, the results showed that the differences in the dimensions of neutral acceptance (p=0.066), approach acceptance (p=0.087) and escape acceptance (p=0.085) were not significant at alpha=0.05, with individuals aged up to 49 years adopting behaviors related to neutral acceptance, approach acceptance and escape acceptance to a marginally greater degree (Table 2).

Table 2. ANOVA results for the dimensions of attitudes toward death and quality of life by age group

	Age							
	Up to 49		50-64		Over 65			
	M	SD	M	SD	M	SD	F	p
Fear of death	3.34	1.70	3.26	1.36	3.57	1.90	0.157	0.855
Death avoidance	4.20	1.24	3.34	1.33	3.01	1.21	2.399	0.104
Neutral acceptance	3.46	1.51	2.29	1.24	2.57	1.07	2.890	0.066
Approach acceptance	3.43	1.03	2.46	1.46	2.43	1.12	2.581	0.087
Escape acceptance	3.94	1.58	2.69	1.46	2.73	1.49	2.612	0.085
PCS-12	49.30	5.00	36.80	8.56	33.13	7.67	17.81	0.000
MCS-12	49.41	9.85	35.22	11.67	34.12	11.29	7.717	0.001

Comparisons by educational level

Finally, the possible differentiation of quality-of-life and death-attitude outcomes by educational level was investigated using one-way ANOVA for more than two independent samples.

The results showed a statistically significant differentiation in quality-of-life outcomes in the physical health dimension, at a significance level of alpha=0.05, by educational level. More specifically, physical health-related quality of life differed significantly by educational level (F=8.485, p<0.001). In contrast, no significant difference emerged in mental health-related quality of life (F=1.679, p=0.185).

In addition, Bonferroni's multiple-comparison test was used to identify the educational levels between which a statistically significant difference was found in the physical health dimension of quality of life. The test results showed that graduates of compulsory education (M=31.87, SD=8.63) had significantly poorer quality of life (95% CI: [-23.3, -6.01], p<0.001) than graduates of higher education (M=46.55, SD=7.40). Similarly, graduates of compulsory education had significantly poorer quality of life (95% CI: [-22.17, -1.40], p=0.018) than holders of a master's or doctoral degree (M=43.66, SD=9.63). In addition, graduates of secondary education (M=34.65, SD=13.01) showed significantly poorer quality of life (95% CI: [-18.49, -0.39], p=0.036) than graduates of higher education. At the same time, no significant difference was observed between graduates of compulsory education and graduates of secondary education (95% CI: [-2.42, 12.89], p=0.395>0.05), or between graduates of secondary education and holders of a master's or doctoral degree (95% CI: [-17.26, 4.15], p=0.590).

Regarding the dimensions of attitudes toward death, a significant difference by educational level emerged in the behaviors related to avoidance (F=4.561, p=0.008), approach acceptance (F=4.007, p=0.013) and escape acceptance (F=4.073, p=0.012). As above, a Bonferroni multiple-comparison test was performed to investigate the educational levels between which statistically significant

differences were found in the dimensions of avoidance, approach acceptance and escape acceptance. As observed, graduates of compulsory education (M=2.71, SD=1.29) tended to adopt death-avoidance behaviors to a lesser extent (95% CI: [-3.59, -0.36], p=0.010) than holders of a master's or doctoral degree (M=4.68, SD=0.91). In addition, graduates of compulsory education (M=2.08, SD=1.00) adopted approach-acceptance behaviors to a lesser extent (95% CI: [-2.86, -0.18], p=0.013) than graduates of higher education (M=3.61, SD=1.29), while finally, graduates of compulsory education (M=2.24, SD=1.11) adopted escape-acceptance behaviors to a lesser extent (95% CI: [-3.52, -0.35], p=0.009) than graduates of higher education (M=4.18, SD=1.27) (Table 3).

Table 3. ANOVA results for the dimensions of attitudes toward death and quality of life by educational level

		Educational level				F	p
		CE	SE	HE	MSc/PhD		
Fear of death	**M**	3.10	3.60	2.95	4.69	1.717	0.178
	SD	1.94	1.45	1.22	1.44		
Death avoidance	**M**	2.71	3.40	3.83	4.68	4.561	0.008
	SD	1.29	.80	1.40	.91		
Neutral acceptance	**M**	2.26	2.51	3.58	2.97	2.627	0.062
	SD	1.06	1.22	1.06	1.74		
Approach acceptance	**M**	2.08	2.61	3.61	3.29	4.007	0.013
	SD	1.00	1.15	1.29	1.41		
Escape acceptance	**M**	2.24	3.02	4.18	3.43	4.073	0.012
	SD	1.11	1.68	1.27	1.86		
PCS-12	**M**	31.87	37.10	46.55	43.66	8.485	0.000
	SD	8.63	6.96	7.40	9.63		
MCS-12	**M**	35.81	34.65	41.46	45.99	1.679	0.185
	SD	10.21	13.01	14.63	12.51		

DISCUSSION

The family, as a complex system governed by rules of homeostasis and development, seeks points of balance between maintenance and the development of its members.(21) Therefore, understanding family experiences in the process of living-donor kidney transplantation reflects the need to reconsider the care provided to the recipient, the donor and the family, in both physical and emotional aspects.

In the study by Goreti et al. (2015), it was observed that treatment of chronic kidney disease leads to partial loss of autonomy and changes in mood, with the result that patients become temporarily dependent on their family, for whom they become a priority. Consequently, the daily lives of both sides are modified with the aim of promoting treatment in clinics and/or at home.(41) The results of other studies highlight the consequences, for family unity, of the experience of a family affected by chronic kidney disease and undergoing living-donor transplantation within the family environment.(42, 43)

Both the diagnosis(44) and the hemodialysis process have a direct effect on families and their dynamics.(45) At the same time, the organ transplantation process, as well as the period of waiting for it, is accompanied by intense feelings of anxiety and fear of death for both patients and their families.(46-50) In addition, nephrology patients have to face both the typical problems of transplantation(50-53) and the impairment of quality of life (QoL) due to renal failure.(54, 55) Fear of death, regardless of pathology, may assume a specific role, as high anxiety contributes to lower levels of patient recall and increases the risk of non-adherence to treatment, with patients believing that death would be a solution.(56)

The pain and suffering of families in serious illnesses, as well as fear of death as a consequence of mortality, increase anxiety levels, which in turn worsen health conditions.(57) In previous studies related to organ donation, the issue of death is mentioned only briefly and without a theoretical basis. Quantitative studies in the field measure death-related concepts such as religiosity, bodily integrity and death anxiety,(58-60) while qualitative studies identify statements referring to fear of death and the concept of taboo.(61)

Death taboos and superstition constitute the two main psychological mechanisms associated with how individuals cope with the possibility of their own death. Therefore, and because current results are mixed, a better understanding of the link between anxiety surrounding death and discussion is required. None of the existing studies has described the psychological mechanisms involved when dealing with a phenomenon related to death and that may influence behaviors during discussions with family members.

The impact of providing care to patients with chronic diseases has been studied for various illnesses. Caregiving may be associated with emotional difficulties, such as depression, a variety of symptoms related to anxiety, fear of death, excessive medication use, a negative impact on perceived physical health and reduced quality of life.(62-64) Investigating ways to support caregivers may have beneficial effects for both the patient and the caregiver. Emphasis has been placed on identifying family caregivers and assessing their caregiving burden in order to optimize caregiver well-being.(65-67) Discussion of coping skills can improve the caregiver's QoL even in the difficult environment of end-of-life care.(65) Psychosocial intervention may have significant positive effects on caregiver burden and improve caregivers' satisfaction with their role.(65-67)

After a systematic review of the literature, only three articles were identified describing interventions for caregivers of patients with CKD. In all cases, the effect of educational material provided to the caregiver was evaluated and an improvement in knowledge was described, without reference to other outcomes. Overall, it is concluded that the burden of CKD care is similar to that observed with other chronic diseases.(68)

STUDY LIMITATIONS

The main limitation of the study was the small sample size (50 families) and the fact that the sample was selected using convenience sampling. The small sample size and non-random sample selection are important limiting factors associated with the external validity of the research. Failure to achieve external validity is a limitation that prevents the generalizability of the results to the entire population of families of Potential Organ Donors and Recipients.

CONCLUSIONS

CKD is a long-term disease accompanied by numerous different morbidities, with significant physical and psychological effects both on the person who is ill and on the family environment, which assumes the role of caregiver. Living-donor organ transplantation is of key importance in disease management. However, beyond the expected positive consequences for the health and quality of life of the patient and caregivers, the transplantation process is associated with significant difficulties at various levels, which are a source of stress and fear. To address them, positive psychology and the attitude of the family, both of Potential Organ Donors and of Potential Organ Recipients, are decisive parameters.

These families are confronted with experiences of death, grief and fear of death, while limited and non-in-depth studies have been conducted on the issue of death in the case of organ donation. At the same time, studies dealing with ways to help caregivers of individuals with CKD are also limited, and those that have been conducted focus mainly on the educational material provided.

Within the context of this study, the aim was to determine, through the DAP-R questionnaire, after appropriate translation and validation into Greek, the attitudes toward death of the families of Potential Organ Donors and Recipients. At the same time, demographic factors (gender, age group, educational level) that may be related to quality of life and the adopted attitude toward the possibility of death were examined. Overall, the analysis of the data collected yielded important conclusions, which should be confirmed by newer, larger-scale studies, possibly including more countries and health systems.

Given the importance of the family's opinion and the value of support from the family environment both when making important decisions, such as organ donation, and when dealing with difficulties arising from chronic conditions, the adoption of appropriate measures for the practical support of families of patients and of potential organ donors is considered crucial. In order for this to be integrated into clinical practice and maintained, it is necessary to train nursing staff, who are the first people to whom these families turn for help, as well as physicians. In addition, it would be useful to facilitate corresponding studies in the future, possibly by informing and encouraging patients and their caregivers through the healthcare structures that monitor them to participate voluntarily by completing questionnaires or providing anonymous interviews. Finally, emphasis should also be placed on nurses' views and on investigating the practices followed to date, in order to identify points that could be improved.

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RESEARCH ARTICLE

Occupational exposure of healthcare workers to biological agents in a University Hospital of Northern Greece; A retrospective study

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ABSTRACT

Introduction: Healthcare workers who perform invasive procedures are at increased risk of contact with a patient's blood or other biological fluids. Exposure to blood and body fluids may occur through injuries caused by contact with sharp objects that can penetrate the skin, or through mucous membrane exposure. The risk associated with these accidents lies in the fact that workers are at risk of developing bloodborne infections, particularly hepatitis B and C viruses and human immunodeficiency virus (HIV).

Aim: The aim of this study is to record the frequency of exposure among staff working in a tertiary hospital to blood or other biological agents.

Methods: Data were collected from January 2018 to December 2021 for 365 exposures reported by healthcare workers at a University General Hospital in Northern Greece. The accidents were reported to infection control nurses. The statistical model used for data analysis was SPSS 25.

Results: The majority of accidents involved injury from a sharp object. Almost one tenth of the accidents involved employees with more than two exposures. Thirty percent of accidents occurred among employees with less than five years of work experience. The exposure frequency among employees was 20.92%. During the first pandemic years, occupational exposures decreased by almost 30%, as a result of the continuous vigilance of the infection control office, which provided daily updates on measures to prevent the then unknown coronavirus.

Conclusions: Occupational exposures are common in the hospital environment. The pandemic appears to have affected the frequency of accidents. The majority of employees complied with hygiene and safety rules. However, the number of accidents indicates that more intensive education is needed regarding bloodborne diseases, as well as measures for the prevention and management of occupational exposures.

Keywords: sharps injuries, healthcare workers, occupational exposure, bloodborne diseases, needle

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INTRODUCTION

Healthcare workers, particularly nurses (Vitello et al, 2024), who perform invasive procedures are at increased risk of contact with a patient's blood or body fluids (Elseviers et al, 2014; Alwabr, 2018). A sharps injury occurs when sharp instruments penetrate the skin tissue. If the sharp instrument is contaminated with blood and body fluids, there is a possibility of infection transmission. Exposure to blood or other biological fluids in healthcare settings is a common occurrence for healthcare workers in their daily practice (Perry, Parker and Jagger, 2003). However, the literature is replete with cases of non-reporting to the dedicated surveillance teams responsible for such exposure incidents (Doebbeling et al, 2003; Musa et al, 2014), even though such accidents constitute a small, but not insignificant, risk of exposure to potentially fatal bloodborne viruses (Almoliky et al, 2024).

Reports by the World Health Organization indicate that 1 in 10 healthcare workers worldwide sustains a needlestick injury every year (Prüss-Ustün, Rapiti and Hutin, 2005). In the United States, approximately 600,000-800,000 sharps injuries occur annually among medical personnel (Rapparini, 2006).

Exposure to blood and body fluids may occur through injuries following contact with sharp objects (needle, blade, scalpel, or other medical instruments that can penetrate the skin) or through mucous membrane exposure (such as the eye, mouth, or damaged skin tissue) (Fadil et al, 2021). According to a report by the Royal College of Nursing (2021), such exposures are highly hazardous because they can transmit almost any pathogen present in human blood, while reports have documented approximately 60 pathogens that may potentially be transmitted to healthcare providers.

As noted earlier, hospital workers are at risk of developing bloodborne infections, particularly hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) (Tarigan et al, 2015), which carry significant morbidity and mortality and account for the vast majority of occupational infections reported in hospital settings (Tarantola, Abiteboul and Rachline, 2006).

In addition, there is an economic burden borne by employers due to occupational exposure to infectious diseases transmitted through blood or other biological fluids, which includes costs for laboratory tests, treatments, and lost working hours (Lavoie, Verbeek and Pahwa, 2014). The World Health Organization (WHO) estimates that sharps exposure in the hospital setting is responsible for 2-3% of HIV infections and 40% of HBV and HCV infections among workers (WHO, 2002). The annual cost of occupational exposures is estimated to range from 6.1 million dollars in France to 118-591 million dollars in the USA (Saia et al, 2010).

After exposure to biological agents, reporting the accident is essential for treatment and prevention purposes. Healthcare workers' exposure to blood or other biological fluids threatens both their physical health and their psychological balance, while also alerting employers to the need to strengthen preventive programs that prevent such accidents (RCN, 2021). Especially for workers exposed to HIV, the psychological and emotional disturbance caused produces negative emotions (Almoliky et al, 2024), which may even lead them to resign (Elseviers et al, 2014).

In hospital settings, occupational accidents due to exposure to blood or other biological fluids must always be recorded. Hospitals have surveillance systems for monitoring the rates of such accidents, as well as the possible risk factors associated with these injuries. Immediate reporting of blood exposure following injury from sharp objects, as well as exposure to other infectious agents, is necessary so that prophylactic treatment can be administered. Preventive strategies such as the education of hospital employees, increased use of universal precautions, and implementation of safety devices have been shown to significantly reduce such exposures (Prassana, Dick and Murphy, 2007).

As already mentioned, exposure to blood or other biological fluids in healthcare settings is a common occurrence for healthcare workers in their daily practice (Musa et al, 2014). McCormick and Maki (1981) were the first to recognize and describe occupational exposure among workers in healthcare settings, proposing a series of strategies for controlling and limiting these accidents. These strategies included a series of educational programs focused on the proper management of sharp objects, such as their correct disposal in sharps containers, as well as avoiding needle recapping. However, strategies mainly focus on frequent briefing of clinical departments by those responsible for monitoring occupational exposures, with emphasis on educating healthcare workers, increasing the use of universal precautions, and implementing safety devices, interventions that have been shown to significantly reduce such exposures (De Carli et al, 2022).

One of the most important problems faced by occupational exposure control services is underreporting (Doebbeling et al, 2003; Musa et al, 2014), since immediate reporting of blood exposure following injury from sharp objects, as well as exposure to other infectious agents, is necessary so that prophylactic treatment can be administered (Viode et al, 2012). The result of underreporting is failure to follow the scheduled post-accident testing instructions, lack of scheduled follow-up by an infectious disease specialist, and inadequate adherence to prophylactic treatment protocols (Pérez-Diaz et al, 2015). As also noted above,

workers' lack of knowledge, lack of time due to workload, and lack of risk awareness (Wang et al, 2003; Joukar et al, 2018; Li, He and Zhao, 2024) are factors associated with low compliance with occupational exposure management protocols.

Regarding immediate control measures after exposure to blood and other biological fluids, the protocol of the National Public Health Organization (EODY, 2019) is followed. After care of the injured area, the incident should be reported to the supervisor and to the hospital infections office. If the exposure involves a suspected HIV case, information on antiretroviral treatment should be provided by infectious disease specialists. Moreover, the literature shows that adherence to antiretroviral treatment is associated with reduced viral load and delayed onset of HIV (Abadie et al, 2024). Scheduled testing for a healthcare worker exposed to HIV is performed at 6 weeks, 3 months, and 6 months after exposure, while follow-up by an infectious disease specialist is recommended. Testing of the healthcare worker must always be performed for HIV, HBV, and HCV in all accidents.

Regarding the management of hepatitis B prophylaxis, the decisions to be made depend on the number of antibodies (Anti-HBs), the presence of HBsAg, and the vaccination coverage of the worker. For prophylaxis against hepatitis C virus, there is no recommendation for immunoglobulin administration, while the healthcare worker should be placed on a periodic testing protocol (repeat Anti-HCV and ALT testing at 4-6 months after exposure and HCV-RNA testing at 4-6 weeks).

The aim of our study is to investigate the frequency of sharps injuries and to identify the risk factors for these injuries among healthcare workers in a General Hospital in Northern Greece during the period 2018-2021.

MATERIALS AND METHODS

The quantitative study analyzed data from a 4-year period (from January 2018 to December 2021) for 365 exposures to blood and other biological fluids reported by 315 healthcare workers (HCWs) at a University General Hospital in Northern Greece. The accidents were reported to the hospital infection surveillance team. This hospital is one of the largest in Northern Greece, with almost 700 beds. In all accident cases, an epidemiological form concerning details of the exposure was completed. Specifically, the demographic data of the exposed healthcare worker and the exposure source (patient), data concerning the circumstances of exposure, the injury site, the cause of the accident, and the immediate measures taken after the accident were recorded. Personnel were classified according to professional status as physicians, nurses, building support staff, allied health personnel, nursing students, and medical students.

HCWs who came into contact with HBsAg-positive patients and who either had not been immunized or had been immunized but did not have an adequate number of Anti-HBs (<10 mIU/mL) received HBV immunoglobulin and, at the same time, began a complete immunization schedule (three-dose vaccination) or received a booster dose of vaccine (10 mIU/mL < Anti-HBs < 100 mIU/mL). In the case of an unknown source, HCWs were given antiretroviral treatment, followed a periodic testing schedule, and were monitored by the special infections department. When HCWs were exposed to an HCV-positive patient, they underwent initial serological testing and retesting with anti-HCV at 4 and 6 months, and HCV-RNA testing at 6 weeks. Finally, all HCWs who came into contact with HIV patients were referred to the special infections office for further instructions from infectious disease specialists, while antiretroviral treatment was administered after written consent. These HCWs underwent serological testing for anti-HIV at 6 weeks, 12 weeks, and 6 months.

Data related to age, gender, work experience, professional status, department of origin, mechanism of injury, causes of injury, measures taken after the accident, the shift during which the accident occurred, accidents involving bloodborne diseases, and antibody levels (Anti-HBs) were analyzed. The statistical model used for data analysis was SPSS 25.

The study protocol was submitted to the Bioethics and Ethics Committee of the University General Hospital in Northern Greece where the study was conducted. The basic principles governing the research are confidentiality and anonymity. The name or any other personal identifier of the participants is not recorded anywhere.

RESULTS

During the study, out of a total of 1,744 hospital employees, 315 workers reported one or more exposures to blood or other biological fluids, recording a total of 365 accidents. Specifically, one worker was exposed 6 times, 7 workers 3 times, and 42 professionals were exposed twice, while two of these had 3 exposures within a 6-month period. The exposure frequency among workers who had direct or indirect contact with patients was 20.92%. Regarding the professional status of those exposed, 48.2% (176 accidents) involved nurses, 31% (113/365 accidents) physicians, 4.1% (15/365 accidents) cleaning staff, 3% (11/365 accidents) medical students, while 6.8% (25/365 accidents) were nursing students. The data are presented in Table 1.

Table 1. Number of exposures by professional category

Professional category	Number of exposures	Exposure percentage
Nurses	176	48.2%
Physicians	113	31%
Cleaning staff	15	4.1%
Allied health personnel	25	6.8%
Medical students	11	3%
Nursing students	25	6.8%
Total	365	100%

Of the total 365 accidents, 260 involved female workers and 105 involved male workers. There was no association between sex and exposure in any professional category of workers, except one. In this specific category of workers, namely nurses, women presented higher injury rates than men, as shown in Table 2. Of the 176 accidents that occurred among nurses, 26 involved men and 150 involved women, while the distinction of these accidents by department, sex, and professional status revealed that the medical sector had only 10 injuries among male nurses out of 95 total exposures, the surgical sector had only 1 injury among a male nurse out of 12 total injuries, the operating theatre department had 7 exposures among male nurses out of 30 total injuries, and the Emergency Department (ED) had 2 exposures among male nurses out of 17 total injuries. In this specific categorization of accidents by sex, department, and professional status, no significant deviation was demonstrated among physicians, except for the surgical clinics, where 34% (8/23 exposures) involved female physicians and 66% (15/23 exposures) involved male physicians.

Table 2. Nurses' exposure according to sex and department

Nurses by department	Male injuries	Female injuries
Medical clinics	10	85
Surgical clinics	1	11
Operating theatres	7	23
ED	2	15
ICU	3	8
Allied health	3	8
Total	26	150

The association between age category and accidents revealed that the highest percentage of accidents was observed in the category of workers aged >50 years, with 105 accidents (28.8%), while in the other categories the percentages were relatively similar: 21.6% in the 20-30 years category, 25.5% in the 31-40 years category, and 24.1% in the 41-50 years category. Interesting results were revealed when this category (age group and accidents) was associated with professional status (Table 3).

Table 3. Accidents by professional category and age

Age (years)	Nurses	Phys.	Nursing students	Cleaning staff	Allied health	Medical students
20-30	14	36	12	1	5	11
31-40	39	40	8	2	4	0
41-50	52	21	4	4	7	0
>50	71	16	1	8	9	0

Specifically, nurses showed a higher tendency for exposure to blood and other biological fluids in older age categories. A progressively greater increase was observed as the age category increased. More specifically, of the 176 accidents that occurred among nurses, 7.9% belonged to the 20-30 years category, 22% to the 31-40 category, 29% to the 41-50 category, and 40% to the final category of >50 years.

Similar trends to those observed among nurses were also identified in two other categories of workers. Increased accident rates in the two older age categories (41-50 and >50 years) were observed both among cleaning staff and among allied health professionals. Specifically, among cleaning staff, almost 80% (12/15) of accidents occurred in individuals over 41 years of age, while among allied health workers the corresponding percentage was 64% (16/25). For physicians, medical students, and nursing students, the exposure frequency was higher at younger ages (in the 20-30 and 31-40 years categories), with percentages of 67%, 100%, and 80%, respectively.

Most accidents occurred during the morning shift (07:00 am-15:00 pm), specifically 244 exposures (66.8%). The shift with the next highest exposure frequency was the afternoon shift (15:00 pm-23:00 pm), during which 98 accidents occurred (26.8%), while the fewest occurred during the night shift (23:00 pm-07:00 am) (6.3%). The results revealed that no differentiation was observed for any professional category.

Regarding the reasons for occupational exposure, carelessness, at a rate of 64.1%, is a very important factor, with haste being the second most important cause of exposure at 17.3%. Negligence and the presence of an agitated patient were reported at lower rates, 6.8% and 11.8%, respectively. A noteworthy finding concerns the actions followed by healthcare workers, as 39/176 nurses used bleach to care for their exposure site. The use of bleach instead of proper management with washing with water or use of antiseptics was also observed among physicians (14/113), cleaning staff (3/15), allied health personnel (8/25), medical students (2/11), and nursing students (4/25).

The association between accidents and the clinical area in which they occurred revealed that by far the highest number of accidents occurred in the medical sector, at a rate of 46.6% (170/365 exposures). The operating theatre area, with a large difference from the medical sector, followed with 54 accidents (almost 14.8%), while 46 (12.6%), 42 (11.5%), and 39 (10.7%) accidents were recorded in the surgical sector, central laboratories, and ED, respectively. Finally, the ICU was the department with the lowest percentage of worker injuries, with 14 accidents and a rate of 3.8%.

A total of 76.2% of injuries (278/365) involved injury from sharp objects (needle, venous catheter), while the next most frequent injury involved mucous membrane exposure, at a rate of 14.5% (53/365). The remaining percentage (almost 6%) involved skin injury following trauma from other sharp materials (scalpels), while a small category of 3.3% concerned other failures in daily practice. The ways in which healthcare workers were exposed involved a series of different practices. The majority of accidents (80/365) involved invasive surgical procedures, at a rate of 21.9%, while blood sampling, peripheral vascular catheterization, needle recapping, incorrect disposal of sharps in special containers, and blood glucose testing accounted for 18.9%, 17.8%, 14.2%, 9.3%, and 7.4%, respectively. Finally, 2.5% (9 workers) were punctured by needles left in linen or in waste bags.

Eighty-five of the 365 accidents occurred from patients who had a known bloodborne disease (HIV, HCV, HBV). Of the 365 accidents, 27 were from an unknown source. Among these patients, 20 were HIV-positive, 35 were HCV-positive, and 30 were HBV-positive. Among patients with HIV, 4 also had HCV, while 3 patients with HCV also had HBV. One patient had all three diseases. Forty-seven (47) workers received antiretroviral treatment, of whom 27 had exposure from an unknown source and 20 had exposure from seropositive patients. In none of these 47 cases was seroconversion detected among healthcare workers. Regarding injuries involving seropositive patients, 6/20 injuries involved needlestick injury, 2/20 exposures involved skin injury due to abrasion, while half of the exposures (10/20) involved mucous membrane exposure, mainly of the eyes. From an unknown source, 20 of the 27 accidents involved puncture by a sharp object, 4 involved mucous membrane exposure, and 2 involved skin injury. Of the 30 accidents involving HBsAg(+), 26 were punctures with a sharp object. Most accidents involving bloodborne diseases occurred among staff in medical clinics (41%), with the operating theatre being the second most frequent clinical area for such accidents at 17.6%, while surgical clinics and the ED accounted for 11.7% and 10.5%, respectively. No association was found between exposure to a known bloodborne infectious source and age status. Of the 365 accidents, in 317 (86.8%) healthcare workers had an adequate number of antibodies, while immune insufficiency was observed in 48 (13.2%).

DISCUSSION

Occupational exposures are a common phenomenon in the hospital environment, since almost half of healthcare workers will experience an accident during their career (Bairami et al, 2024). However, they are not irreversible, as organized prevention strategies have shown signs of improvement (Prassana, Dick and Murphy, 2007).

In our study, the overwhelming majority of accidents

involved injury from a sharp object, following the findings of many research studies (Rapparini, 2006; White, 2007; Cho et al, 2013). In addition, a notable finding is that almost 13% of accidents occurred among workers who reported more than 2 exposures during the four-year study period. This finding does not agree with other studies in which re-exposure rates were many times higher than in our research (Martins et al, 2012).

In our study, a higher exposure rate was reported among women than among men, at almost 70%, with our data agreeing with other studies (Gheshlagh et al, 2018). An association between sex and exposure existed in only one specific category, namely the nursing profession. Almost 6 out of 7 nurses who were exposed were women, while among physicians the ratio of exposed men and women was similar. The difference in the distribution of accidents by sex, especially in the nursing profession, may be due to the fact that this professional category has traditionally been associated with the female sex (Meadus and Twomey, 2011), whereas this assumption does not apply in the medical profession (Levinson and Lurie, 2004). Our findings contrast with those of other studies reporting a higher frequency of injuries among male nurses than among female nurses (Saadeh et al, 2020).

Regarding the association between sex and clinical area, a difference was identified only in the medical sector, since male nurses clearly had fewer accidents than their female colleagues, while there was no significant difference in the remaining clinical areas. This may also be explained by the fact that medical departments had more frequent and demanding contact with patients, while also bearing the burden of nursing care for Covid-19 patients. In the medical profession, only in surgical clinics was a higher proportion of accidents observed among surgeons due to the many invasive procedures (Viode et al, 2012), while the fact that male surgeons had more accidents than female surgeons may be explained by the fact that the surgical profession is traditionally associated with the male sex (Hirayama and Fernando, 2018).

According to the international literature, nurses are the professional category with the highest frequency of exposure to blood and other biological fluids (Elseviers et al, 2014; Vitello et al, 2024). Our study reached the same conclusions, as almost 1 in 2 exposed workers belonged to the nursing profession. The fact that nurses are traditionally the professionals who spend the most time caring for patients (Vitello et al, 2024), and that they constitute the largest professional group in the hospital environment, may be possible reasons for these findings. Of course, there are also studies that record contrary results, reporting that physicians are the professional category most prone to injuries from sharp objects (Wicker et al, 2008).

Non-compliance with recommended infection control precautions was the main factor contributing to injuries during the study. In most cases involving placement of peripheral venous lines or the blood glucose testing procedure, workers reported that they did not have sharps disposal containers available nearby during their invasive practice, while when they did have them, the containers had exceeded the safe fill limit. These findings agree with the results of other studies emphasizing that such superficial injuries can be prevented through compliance with recommended protocols (Rice et al, 2015).

Studies report that the SARS-CoV-2 pandemic resulted in a reduction in the frequency of exposure to blood and other biological fluids, mainly following injuries from sharp objects (Diktas et al, 2021). The arrival of SARS-CoV-2, as well as the unknown consequences it caused for the health of those who became ill, sounded the alarm for infection surveillance teams, which considered that hygiene and safety programs for healthcare personnel might deteriorate due to the COVID-19 pandemic. In our study, during the period of the first and second pandemic waves (that is, throughout the year 2020), the number of accidents decreased by almost 30%, a finding that disagrees with the results of other studies that did not observe changes in the incidence of accidents (Diktas et al, 2021). This decline in accidents in our study may also be due to the vigilance of the hospital infection surveillance office, which informed clinical departments daily about the correct use of PPE and the prevention of transmission of the novel coronavirus. This may also have led to the creation of a trend toward greater compliance, making healthcare workers more careful. Therefore, compliance due to fear of exposure to the then unknown virus led to a reduction in accidents during the pandemic period. However, some studies suggested that the pandemic led to an increase in exposure to blood and other biological fluids because workers were unprepared to deal with such demanding care (Stojic, Grabovac and Lucijanic, 2022), while the extensive use of PPE often constituted an obstacle to the quality and safe care of Covid-19 patients, making this practice dangerous for healthcare workers themselves (Galanis et al, 2021).

Our study showed an almost balanced association between accidents and age, since the category >50 years had a slightly higher frequency of exposure (almost 28%). Other studies emphasize that age is an important factor that acts synergistically in the observation of increased incidents of exposure to biological agents, especially at ages <25 years (Smith et al, 2006). Similar conclusions regarding the association between young age and the occurrence of accidents are also emphasized in the Royal College of Nursing report (RCN, 2021), although the researchers are cautious because of the special circumstances created by the pandemic. However, other studies had findings similar

to ours and reported no significant association between age and the frequency of occupational accidents in hospital settings (Fredrich, Nsubuga and Jaakkola, 2005). A particular finding in our study concerned the association between age and professional category, where a high incidence of accidents was observed among nurses over 50 years of age compared with other age groups, while high exposure rates were also observed for cleaning staff and allied health professionals in the same age category. For medical and nursing students, the frequency of injuries was evident and is explained by their limited work experience (Ehsani et al, 2012).

In addition, work experience was also implicated in our study, since 30% of accidents occurred among workers with less than 5 years of service. These findings agree with other studies showing that more experienced workers had lower injury rates (Zhuo et al, 2018; Bazie, 2020). This may be because more experienced healthcare professionals have more complete and advanced skills in handling sharp objects and may therefore present a lower risk of sharps injury. However, we should not forget the phenomenon of bullying of new employees by older ones, within which a greater workload is transferred to younger workers, directly affecting their daily practice (Yıldırım, 2009). Due to excessive workload and time pressure, younger workers cannot complete their duties on time, often resulting in negative treatment by their superiors and making them vulnerable to occupational exposures.

Our study showed that carelessness due to haste was the most important factor in occupational exposure among healthcare workers, with our findings agreeing with other research studies (Siddique et al, 2008; Zafar et al, 2008). Fatigue resulting from the pressure to complete more tasks within a defined period is the likely explanation for this association between haste and exposure frequency (Bazie, 2020).

Our findings regarding the actions followed after exposure for care of the injury site were also noteworthy, as 1 in 5 nurses used bleach instead of washing with soap and water. The fact that the majority of these nurses who used bleach were over 50 years old may indicate difficulty in assimilating and adopting the educational programs that clearly describe the correct management of the wound area. In general, studies show that nurses do not have a satisfactory level of knowledge regarding exposure to biological agents (Garus-Pakowska and Górajski, 2019).

Finally, seroconversion rates among workers exposed to blood or other biological fluids in our study were zero, supporting the view of other researchers who emphasized that rates were very low, such as 0.1% for HCV (Egro et al, 2017). In addition, the immunization rate of exposed workers was very high. The incidence of injuries from a known source with HIV was lower than for HBV and HCV, as in other studies (Agustian et al, 2019). According to studies, although the frequency of infection by bloodborne diseases increases when the patient has co-infection (Sulkowski, Ray and Thomas, 2002), no seroconversion was observed from patients with simultaneous HIV and HCV, HIV and HBV infection, or all three diseases, findings that agree with previous studies (Yazdanpanah et al, 2005).

CONCLUSIONS

Handling sharp objects constitutes a significant risk for healthcare workers. Therefore, those responsible for healthcare units should develop strategies to improve the working conditions of healthcare professionals. The cornerstone of the multifaceted strategies for accident prevention will be the education and information of healthcare professionals. Training and education of healthcare workers for the prevention of sharps injuries and exposure to other biological fluids is part of their professional identity. Given the existence of legislative requirements to protect workers' health and safety, the literature has shown that investigating the outcomes of education reduced the anxiety and insecurity of healthcare workers regarding the prevention of occupational exposures (Moayed et al, 2015). Education will therefore strengthen healthcare professionals' ability to assess dangerous situations and manage medical equipment safely. After all, in a society of progress and well-being, the safety of the working environment is one of its defining characteristics for smooth functioning.

Author contributions

Lambros Tabakas analyzed the data and contributed to the interpretation of the results, the writing of the manuscript, and the collection of the literature. Ioannis Istikoglou, Eirini Georgopoulou, Konstantinia Bampi, and Evangelia Pontika participated in the design of the study as well as in data collection. Parthenopi Pantelidou evaluated the final manuscript. All authors approved submission of the final manuscript.

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RESEARCH ARTICLE

Impact of Prevention Programs on Community Health in Greece

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ABSTRACT

Preventive health is one of the most important elements related to the well-being of society, and in recent years most countries have developed programs in this field. Public knowledge of these programs and their use by citizens are crucial to the extent to which they can ultimately contribute to improving the standard of living. The present study investigates the influence of these preventive health programs in Greece and examines both their benefits and the difficulties they continue to face, such as low public awareness, barriers to accessibility and varying levels of social acceptance. Data were collected using a structured questionnaire distributed to a substantial sample of people through a popular social networking site. The survey assessed participants' knowledge, awareness of availability and participation in important preventive measures, such as vaccinations, regular check-ups and programs that support both physical and mental well-being. The analysis identifies significant gaps in information dissemination and shows a moderate level of public engagement with the available prevention services. These results suggest that, although prevention programs have significantly positive effects on public health, their effectiveness continues to be limited by unequal use and insufficient outreach. This paper highlights the need for targeted communication strategies, as well as more extensive community-based interventions. To improve program uptake and achieve long-term population-level health outcomes, prevention education must be strengthened.

Keywords: prevention, community health, prevention programs, research, Greece, questionnaire, health improvement

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INTRODUCTION

Health is a fundamental human right and can undoubtedly function as a key prerequisite for the well-being and cohesion of a society. As defined by the World Health Organization (WHO), health is not simply identified with the absence of disease, but includes the overall state of physical, mental and social well-being (WHO, 1948). Within this context, prevention programs play a leading role in promoting public health, seeking to reduce risk factors and improve overall quality of life.

Prevention programs are categorized into three fundamental levels. The first, primary prevention, focuses on preventing the onset of disease through measures such as vaccinations and the encouragement of healthy habits across the entire population (Glanz, Rimer, & Viswanath, 2008). Next comes secondary prevention, which includes screening and diagnostic procedures designed for early disease detection and timely intervention (Tones & Tilford, 2001; Glanz, Rimer, & Viswanath, 2008). The final level, tertiary prevention, focuses on the management of long-term conditions and on supporting recovery and rehabilitation (Naidoo & Wills, 2016). The importance of prevention goes beyond merely reducing healthcare costs; it also plays a key role in ensuring equal access to essential health services for all. In Greece, in alignment with global public health initiatives, national prevention programs are implemented to address critical issues of both national and international interest. These include initiatives such as vaccination campaigns, cancer prevention, addressing obesity and smoking, and promoting mental health. The effectiveness of these programs, however, depends largely on public awareness, understanding and willingness to adopt them. This highlights the need to explore citizens' attitudes and their degree of participation in these preventive efforts.

The aim of the present study is to examine the impact of prevention programs on communities in Greece, highlighting their effectiveness while also identifying areas requiring improvement in order to strengthen overall public health. The study then proceeds to present the findings of the survey that was conducted.

METHODOLOGY

Design

The purpose of the present paper is to present the results regarding the extent to which the public is aware of health prevention programs in Greece. The first questions cover the demographic section, which is analyzed later in the paper, while the following questions examine whether there is knowledge of these programs, whether they are used and how they are evaluated.

Data Collection

The Google Drive platform, through Google Forms, was used to create and maintain the questionnaire. The questionnaire (Appendix 1) was distributed through a social media platform (Instagram) to a broad audience.

Study Sample

The questionnaire was published from 2/11/2024 to 3/11/2024 and collected 8,685 responses. The largest percentage of respondents were women (95%), while the most common age group among participants was 18-25 years (3,117 individuals), followed by the 26-30 age group (2,076). In addition, the majority live in a city (72%), while 40% of those who responded hold an AEI/TEI degree and 19% hold a postgraduate degree.

Based on the analysis of the demographic data, it is important to note that, among the employment sectors of the respondents, the health, food service and education sectors included the largest numbers of individuals. In the next part of the questionnaire, certain questions concerned participants' knowledge of the programs. Of the 8685 respondents, 2,934 did not know what these programs are, corresponding to 33%; in other words, the reason why those who had not used a program had not done so was that they were unaware of it. This therefore indicates a lack of public information.

It is also important to point out that only 46 of the 2,927 individuals who did not know about the programs did not wish to receive further information; therefore, there is a need for information. Of these respondents, 57% believe that the Greek health system acts as an obstacle to their development. This is also immediately evident from the fact that the average rating of information about the programs is 3 (on a 5-point scale), while it is worth emphasizing that social media play a major role in informing people about these programs, since those who know about them learned about them through social media. Regardless of the fact that they become known through mass media, it is very encouraging that everyone understands the importance of initially promoting the programs properly in schools and subsequently in public spaces, while the best-known program among the public is the one for the prevention of cervical cancer. Finally, the results show that most responses given by individuals who participated in the survey, although they knew about the programs, indicated that they had not used any of them. This can be considered relatively reasonable when the ages of the respondents are taken into account.

Statistical Analysis

After the responses were collected, the data were analyzed using SPSS software and the final findings were produced. At the beginning, a Cronbach analysis was performed to test the reliability of the results. The value of 0.807 indicates highly reliable results. Pearson techniques and correspondence analysis were used for the analysis

of correlations. Correspondence analysis is a descriptive, exploratory and non-parametric method that depicts relationships between variables in a multidimensional space.

RESULTS

The survey reveals that, although 33% of participants report that they do not know about health prevention programs, there is notable interest in obtaining more comprehensive information. Among the 2934 individuals who admitted that they lacked knowledge on the subject, only 46 expressed no interest in learning more, highlighting the public's strong desire for better awareness and participation in preventive healthcare. However, 57% of respondents perceive the Greek healthcare system as an obstacle to the progress of prevention, citing issues such as bureaucracy, inadequate infrastructure and limited access to effective services. The average score for the quality of information is 3 out of 5, suggesting that the information provided is considered insufficient. While the media play a key role in raising awareness, the findings also indicate the need for a more structured and coherent promotion strategy. It is encouraging that respondents support the integration of prevention education in schools and public spaces, with the aim of raising awareness from a young age. Integrating prevention programs into basic knowledge could significantly improve public health by enabling individuals to make informed decisions about their well-being.

In addition, the results obtained from the questionnaire show that perceptions of the importance and usefulness of prevention programs significantly influence their evaluation. Participants who judge these programs as valuable for individual and social well-being evaluate them more positively, which indicates that they are more likely to participate in them. The high scores given to questions concerning the organization and quality of the programs are associated with the perception that prevention has a meaningful impact on health, emphasizing the need to improve participants' perception of the social dimension of preventive medicine, even when there is not always full awareness of their social usefulness.

Although most participants appreciate the value of the programs, there is still a lack of public information, which could be strengthened through educational and communication initiatives.

The analysis also showed that participants' age plays a role in knowledge and use of the programs. Younger age groups (18–35 years) show lower levels of awareness and participation in the programs, while older age groups (36–50 years) appear to know more and to use specific programs. Therefore, there is a need to create information strategies that will reach younger audiences more directly, possibly through the use of digital channels and media with which they are already familiar, with the main aim of improving participation and overall awareness of health prevention programs.

Selected results from the Pearson test for correlation analysis are presented, followed by the correspondence analysis diagrams.

The Pearson Correlation is therefore observed for each combination, and in every case the value is statistically significant, since the sig. value is <0.05 (0 throughout), indicating a positive correlation (as it is close to 1).

In practice, this means that when someone considers a program more useful for society, they also perceive it as equally important for themselves and evaluate it positively both in terms of organization and in a more general context. However, it is found that, overall, there is not such a strong positive correlation between how useful it is perceived to be and how it is evaluated (0.357 and 0.337), based on Table 1. This is reasonable, since respondents may have other personal criteria for evaluating the programs beyond their perceived importance.

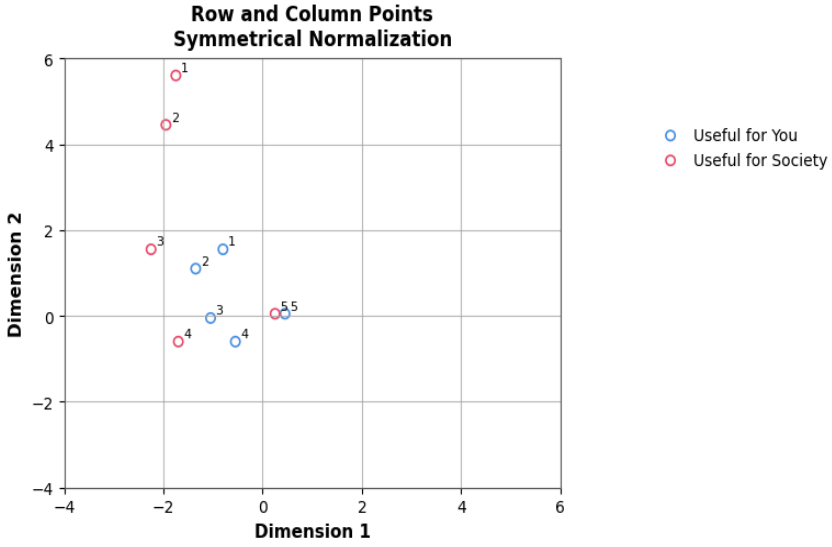
Table 1. Pearson Correlations

		Useful for You	Useful for Society	Program Organization	Evaluation
Useful for You	Pearson Correlation	1	.802**	.785**	.357**
	Sig. (2-tailed)		.000	.000	.000
	N	8684	8684	8684	8684
Useful for Society	Pearson Correlation	.802**	1	.873**	.337**
	Sig. (2-tailed)	.000		.000	.000
	N	8684	8684	8684	8684
Program Organization	Pearson Correlation	.785**	.873**	1	.449**
	Sig. (2-tailed)	.000	.000		.000
	N	8684	8684	8684	8684
Evaluation	Pearson Correlation	.357**	.337**	.449**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	8684	8684	8684	8684

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 1 shows the correspondence analysis regarding how useful participants perceive the programs to be both for themselves and for society. It was noted that those who perceive the importance of the programs for society (5 red) also perceive their importance for themselves (5 blue), because the points on the graph are very close. Similarly, those who perceive the programs as important for themselves (4 blue) state that their importance for society is moderate to high (3 and 4 red).

Figure 1. Correlation of respondents' perceptions of the usefulness of programs for themselves (blue) and for society (red) (1 = little, 5 = very much).



DISCUSSION

The findings of the study provide valuable information about the participants' background, particularly with regard to their occupational sector and level of education. A significant percentage of respondents are employed in sectors such as healthcare, food service and education, which collectively account for the majority of the sample. This distribution could suggest increased awareness of health issues in these sectors—especially among healthcare professionals who are directly involved in prevention efforts. In addition, the presence of participants from the food service and education sectors may underline the critical role of promoting health awareness in settings characterized by regular social interaction.

With regard to educational level, most participants hold a university or technical degree, with a notable percentage having completed postgraduate studies or vocational training at IEK institutes. This suggests that the overall educational level of the sample is relatively high, potentially making participants more receptive to information and participation in health prevention programs. Nevertheless, despite this strong educational background, the data reveal that many workers still do not have sufficient knowledge of the existing programs. This indicates the need to implement targeted informational initiatives—not only to raise awareness but also to enhance the accessibility and understanding of such programs, thereby better addressing the public's needs regarding health prevention.

Furthermore, the results show that participants' perception of the importance and usefulness of prevention programs plays a decisive role in how they evaluate them. Those who consider these programs essential for personal and social well-being tend to evaluate them more favorably and show greater willingness to participate. A positive evaluation of the structure and quality of the programs is closely linked to the belief that prevention has a meaningful impact on health. This highlights the importance of strengthening the public's understanding of the broader social value of preventive medicine, even when there is not full awareness of its social benefits.

While most participants recognize the personal benefits of prevention programs, awareness of their broader social impact remains limited—an area that could be strengthened through targeted educational and communication efforts. The analysis also revealed that age influences both familiarity with and participation in these programs. Younger individuals (aged 18–35) tend

to show lower levels of awareness and participation, while older participants (aged 36–50) are generally more informed and actively participate in specific programs. These results underline the importance of developing tailored strategies to better engage younger audiences—possibly by leveraging mobile-friendly digital platforms that they frequently use—with the aim of increasing participation and improving overall awareness of health prevention efforts.

Older citizens appear to have greater awareness and recognition of the value of prevention programs, and they may not be influenced by digital media to the same extent. Therefore, it is important to develop tailored information campaigns that respond to the specific needs and preferences of each age group, with the aim of increasing participation and improving understanding of prevention actions across all social strata.

CONCLUSIONS

The health prevention initiatives that have been established in Greece address a wide range of issues with the aim of maintaining and improving public health. These programs include efforts to prevent chronic diseases such as diabetes and heart disease, vaccination campaigns, mental health support and disease prevention, as well as health promotion activities in workplaces and schools.

In this study, all current prevention initiatives in Greece are presented and a survey was created to determine public awareness and use. A total of 8,685 responses were collected for analysis.

However, the results show that a significant part of the population is not well informed or does not use these programs, suggesting that they have not yet been widely disseminated or made accessible to all age groups and social groups. This contrasts with the fact that important occupational sectors—such as healthcare and education—show a strong need and interest in information about prevention.

Only 46 of the 2,927 participants with no prior knowledge stated that they had no desire to learn more about health prevention programs. Fifty-seven percent of respondents believe that the Greek health system hinders the promotion of prevention initiatives, despite the fact that mass media constitute an important dissemination channel. It is also emphasized that there is room for improvement, as demonstrated by the average score for the information currently available, which is 3 out of 5. Participants generally agree that it is critical to promote such initiatives in public spaces and schools, as they have the potential to significantly increase public awareness and acceptance of preventive healthcare.

In addition, a large proportion of survey respondents appear to recognize the importance of prevention programs because they have a higher educational level and work in professions that directly support public health. Nevertheless, there is a marked difference in knowledge between younger and older people, as well as in how each individual and society views their use. Although social media have a positive effect on young people's knowledge, the fact that these groups rarely use prevention programs suggests that knowledge alone is not sufficient for active participation.

In summary, although health prevention programs in Greece make an important contribution to strengthening public health, there is a clear need for improvements in communication, accessibility and public awareness. The importance of prevention at both the personal and social level could be strengthened through communication channels that successfully target specific age groups and occupational sectors. Such strategic efforts can play a key role in cultivating a stronger culture of prevention in Greece and in promoting improved health outcomes for the broader population.

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RESEARCH ARTICLE

APPENDIX
QUESTIONNAIRE

The impact of prevention programs on community health

This questionnaire was created for the purpose of conducting research that forms part of the postgraduate thesis of postgraduate students Anna Dimitrakaki & Stella Passari. Thank you in advance for your time!

In 2024, in an era when everything is "moving" around us, individual health should be one of the main obligations for each of us. Prevention programs aim at all areas of citizens' health, providing valid identification of the main chronic diseases, such as cancer, cardiovascular disease and others, which are increasingly developing in our country.

* Indicates required question

Demographic Data

1. Gender *

Only one answer may be selected.

- ◯ Male
- ◯ Female
- ◯ Other
- ◯ I prefer not to answer

2. Age *

Choose only one answer.

- ◯ 18 - 25
- ◯ 26 - 30
- ◯ 31 - 35
- ◯ 36 - 40
- ◯ 41 - 50
- ◯ 51 - 60
- ◯ > 60

3. Place of residence *

Choose only one answer.

- ◯ Village
- ◯ Town
- ◯ City
- ◯ Island

4. Employment status (you may select more than one)

Select all that apply.

- ☐ Student
- ☐ Full-time employment
- ☐ Part-time employment
- ☐ Freelancer
- ☐ Unemployed

5. Employment sector (e.g., food service, health, etc.) *

6. Educational Level *

Select only one answer.

- ◯ General Lyceum graduate
- ◯ Vocational Lyceum graduate
- ◯ University/TEI graduate
- ◯ IEK graduate
- ◯ Master's degree holder
- ◯ Doctoral degree holder
- ◯ Other: _____

7. Do you know what health prevention programs are? *

Select only one answer.

- ◯ YES Skip and go to question 8
- ◯ NO Skip and go to question 15

Health Prevention Programs

Health Prevention Programs

8. Where did you hear about them?

Select only one answer.

- ◯ Social media
- ◯ From my doctor
- ◯ Family
- ◯ Friends
- ◯ Work environment

9. Which of the following programs are you aware of?

Select all that apply.

- [ ] National Program for the Prevention of Cervical Cancer
- [ ] National Program for the Prevention of Breast Cancer
- [ ] National Program for the Prevention of Colorectal Cancer
- [ ] Child and Adolescent Health Prevention Program
- [ ] Program for the Prevention and Management of Cardiovascular Diseases
- [ ] Skin Cancer Prevention Program

10. Which of the above programs have you used?

Select all that apply.

- [ ] National Program for the Prevention of Cervical Cancer
- [ ] National Program for the Prevention of Breast Cancer
- [ ] National Program for the Prevention of Colorectal Cancer
- [ ] Child and Adolescent Health Prevention Program
- [ ] Program for the Prevention and Management of Cardiovascular Diseases
- [ ] Skin Cancer Prevention Program
- [ ] None of the above

11. How useful do you think it was for you?

Select only one answer.

	1	2	3	4	5	
Low	○	○	○	○	○	Very high

12. How useful do you think it is for society?

Choose only one answer.

	1	2	3	4	5	
Little	○	○	○	○	○	**Very much**

13. How organized do you find the existing programs?

Choose only one answer.

	1	2	3	4	5	
Little	○	○	○	○	○	**Very much**

14. How positively do you believe they affect society?

Choose only one answer.

	1	2	3	4	5	
Little	○	○	○	○	○	**Very much**

Skip to and go to question 19

15. **If you have never used any program, what was the reason?**

Choose only one answer.

- ◯ I did not know about them
- ◯ I am not interested
- ◯ I forgot

16. Would you be interested in learning more information about prevention programs?

Select only one answer.

- ◯ YES
- ◯ NO

17. Do you believe there is any benefit to society from prevention programs?

Select only one answer.

- ◯ YES
- ◯ NO

18. Does the Greek health system hinder the development of prevention programs?

Select only one answer.

- ◯ YES
- ◯ NO

Information

19. How do you rate information about the programs?

Select only one answer.

	1	2	3	4	5	
Low	◯	◯	◯	◯	◯	Very high

20. Ways to improve the programs:

Select all that apply.

- ☐ Better information in schools
- ☐ Information campaigns for the public (e.g., in public spaces)
- ☐ Information campaigns in workplaces
- ☐ Better promotion through social media
- ☐ Expansion of programs to cover more conditions

REVIEW

Negative Pressure Wound Therapy Effectiveness in the Care of Diabetic Ulcers Compared to Traditional Methods

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ABSTRACT

Background: Diabetic foot ulcers (DFUs) are associated with substantial morbidity and resource use. Negative-pressure wound therapy (NPWT/VAC) is widely used, but its comparative effectiveness versus conventional local wound care remains under investigation.

Aim: To summarize the effectiveness and safety of NPWT/VAC compared with conventional care in DFUs.

Methods: Data sources included MEDLINE/PubMed and Scopus, with the last search conducted on 01/10/2025 and target publication years ranging from 2018 to 2024. Eligibility criteria comprised comparative studies, including randomized controlled trials and non-randomized studies, involving adults with diabetic foot ulcers (DFUs) that evaluated NPWT/VAC versus conventional care or other dressing modalities. Only studies published in English were included. Study selection and deduplication were performed manually by one reviewer, with duplicate records removed based on title, author, year, DOI, and PMID. Data extraction was also carried out by one reviewer. Risk-of-bias assessment was conducted using RoB 2 for randomized controlled trials and ROBINS-I for non-randomized studies. Due to heterogeneity among studies and the limited number of studies available for each outcome, a narrative synthesis was undertaken, and no meta-analysis was performed.

Results: Overall, 11 studies were included in the review. Randomized controlled trials showed that NPWT may reduce the time required for wound-bed preparation/healing and increase granulation and graft survival, particularly as a bridging strategy before split-thickness skin grafting (STSG). However, final wound closure was not consistently superior to conventional care across all trials. Non-randomized studies supported trends in favor of NPWT, mainly regarding granulation speed. Risks of bias varied, ranging from Low (for example, in rigorously conducted randomized controlled trials) to High (for example, where there were major deviations or missing data). Non-randomized studies were mainly assessed as serious because of confounding and outcome-measurement concerns. Heterogeneity in protocols and outcomes, single-center samples, single-reviewer screening and extraction, and lack of meta-analysis.

Conclusions: NPWT/VAC appears to accelerate wound-bed preparation and granulation and often reduces length of hospital stay in DFUs. However, these conclusions should be interpreted cautiously because of risk of bias and methodological heterogeneity.

Keywords: diabetic foot, DFU, NPWT, VAC, negative pressure, healing

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INTRODUCTION

Diabetes mellitus is a metabolic disorder characterized by elevated blood glucose levels due to impaired insulin secretion, impaired insulin action, or both (Galtier 2010). Since 2022, the American Diabetes Association (ADA) has classified diabetes into four main types based on distinct underlying causes: type 1 diabetes, type 2 diabetes, specific types caused by other factors such as monogenic diabetes syndromes, pancreatic diseases, or drug-induced diabetes, and gestational diabetes. Type 2 diabetes accounts for most cases, representing 90-95% of all cases (American Diabetes Association 2022).

Type 2 diabetes mellitus (T2DM), also referred to as non-insulin-dependent diabetes mellitus, is one of the most prevalent metabolic disorders worldwide. It is mainly attributed to two key factors: reduced insulin secretion by pancreatic beta cells and reduced responsiveness of insulin-sensitive tissues to insulin (Roden & Shulman 2019). It is influenced by a combination of genetic predisposition, lifestyle choices, and the patient's overall health status (Janssen 2021; Wong et al. 2016; Schellenberg et al. 2013; Galicia-Garcia et al., 2020).

Epidemiological data present a concerning picture, particularly for T2DM (Galicia-Garcia et al. 2020). According to the most recent data from the International Diabetes Federation (IDF), the global prevalence of diabetes in 2021 reached 537 million people, with more than 75% of cases occurring in low- and middle-income countries. This number is projected to rise to 643 million by 2030 and to 783 million by 2045. People with diabetes face increased risks of complications, including various cancers such as gastrointestinal, pancreatic, and ovarian cancer; dementia, including Alzheimer's disease; and increased susceptibility to infections, particularly foot, respiratory, urinary tract, and postoperative infections (Tomic & Shaw 2022).

Diabetic foot ulcers (DFUs) are among the most serious complications experienced by patients with diabetes. They are ulcers associated with neuropathy or peripheral arterial disease in patients with diabetes, are common and widespread, and affect 4-10% of people with diabetes, especially older adults (Lauterbach et al. 2010). Worldwide, the annual incidence of diabetic foot ulcers ranges from 9.1 to 26.1 million, while 15-25% of patients with diabetes develop ulcers during their lifetime (Armstrong et al. 2017). Moreover, 85% of lower-limb amputations in patients with diabetes are caused by DFUs (Shojaiefard et al., 2018). DFUs are also among the main causes of morbidity and mortality in patients with diabetes, with a global prevalence of approximately 1.8-6.3% (Zhang et al., 2020).

Diabetic foot ulcers are frequent complications in people with poorly controlled diabetes mellitus. They are often caused by factors such as inadequate glycemic control, neuropathy, peripheral vascular disease, or suboptimal foot-care practices. These ulcers usually develop in areas of the foot exposed to repeated pressure and trauma. Staphylococcal infections often complicate these ulcers (Singer et al., 2018), which typically present as chronic conditions requiring a collaborative interprofessional approach for optimal management (Alexiadou & Doupis 2012). Although most foot ulcers, approximately 60-80%, heal, a substantial proportion, around 10-15%, remain active, and 5-24% may require limb amputation within 6-18 months. Neuropathic ulcers tend to heal within 20 weeks, whereas neuroischemic ulcers require more time and are more prone to amputation (Katsilambros et al. 2010).

Because the treatment of DFUs is complex, ulcers may often remain unhealed for prolonged periods and therefore burden health-care resources through prolonged hospitalization, rehabilitation, and home nursing care (Singer et al. 2018; Alvarez et al. 2015). In addition, diabetic foot ulcer has a negative impact on patients' health-related quality of life, including physical, social, and psychological dimensions. Patients with DFUs often experience mobility limitations that may lead to pain, discomfort, and sleep disturbance, ultimately making them dependent on assistive devices or other people for support (Ashford et al. 2000). Patients also frequently worry about their current ulcers, the risk of developing new ulcers, and the possibility of lower-limb amputation, which further affects their overall well-being (Kontodimopoulos et al. 2016). At present, most clinical treatments are not considered sufficiently effective to guarantee adequate ulcer healing, prompting researchers to develop new therapeutic approaches (Alvarez et al. 2015).

THE NPWT NEGATIVE-PRESSURE METHOD

Negative-pressure therapy, first introduced by Bier in 1908, has been used for more than a century to treat open wounds. The technique regained attention in the 1990s, particularly when Fleischmann and colleagues successfully applied vacuum suction in clinical settings (Fleischmann, Strecker, Bombelli, & Kinzi 1993). Kinetic Concepts, Inc. (KCI, Texas, USA) patented the method under the name Vacuum Assisted Closure (V.A.C.), while the term Negative Pressure Wound Therapy (NPWT) is commonly used in English. This therapy involves the application of evenly distributed local negative pressure to the wound surface. The open wound is covered with a special dressing, either polyurethane or polyvinyl alcohol, and sealed with an airtight film. A set of suction tubes connects the dressing to a control unit, which regulates the primary negative pressure on the wound surface, usually maintaining it between 80 and 125 mmHg, either continuously or intermittently. Fluid extracted from the wound is collected in a canister within the control unit. Treatment duration ranges from a few days to several months, depending on the treatment goals and the nature of the wound (Vikatmaa et al. 2008).

The most common synonyms for Negative Pressure Wound Therapy (NPWT) are Vacuum Assisted Closure (V.A.C.), vacuum sealing therapy, and topical negative-pressure therapy (Mendez-Eastman, 2001). VAC negative-pressure therapy (Vacuum Assisted Closure) has revolutionized how clinicians manage chronic wounds (Singh et al. 2020). It involves placing an open-cell foam dressing over the ulcer area and applying controlled subatmospheric pressure (Vuerstaek et al. 2006). More specifically, VAC promotes ulcer healing in several ways. First, the therapy applies

three-dimensional pressure over the entire wound area, also known as macrostrain, which pulls the wound edges inward in a centripetal manner and thereby contracts the wound. The positive effect of mechanical forces on tissue growth is also noted, particularly through stimulation of cellular migration and mitosis. This therapy enhances the removal of bacteria colonizing the wound and supports wound healing. The use of VAC therapy in large wounds avoided the need for daily dressing changes, thereby eliminating the burden of daily wound dressing and cleaning. Studies have shown that this technique optimizes blood flow, reduces local tissue edema, and removes excess fluid from the wound (Cavanagh et al., 2005). Reducing excessive wound fluid also decompresses small blood vessels, restores microcirculation, and increases oxygen and nutrient delivery to the ulcer. All these factors substantially improve the rate of granulation-tissue formation (Dsouza et al. 2017).

Numerous systematic reviews and studies have demonstrated the effectiveness of negative-pressure wound therapy (NPWT) in the treatment of diabetic foot ulcers (DFUs). Liu et al. (2017) and Chen et al. (2021) found that NPWT is more effective, safer, and less costly than conventional methods. Rys et al. (2020) reported a healing rate of 51% and a significantly lower risk of major amputation associated with NPWT, while Alipour et al. (2021) emphasized its cost-effectiveness. In addition, recent studies, including Arora et al. (2023) and Zhang et al. (2024), confirmed that combining NPWT with other treatments, such as platelet-rich plasma, enhances wound healing and reduces amputation risks. Combined interventions in the diabetic foot aim to accelerate granulation and prepare the wound for definitive coverage when basic care is insufficient. A meta-analysis of randomized studies showed that adjunctive therapies increase healing rates and reduce time to healing, with high to moderate certainty for skin substitutes, PRP, HBOT, and NPWT; in some arms, PRP and HBOT were also associated with a lower risk of major amputation (Monami et al., 2025). Adding HBOT to NPWT in chronic wounds improved the healing rate without increasing pain or microbial burden in a multicenter randomized trial, supporting this combination where there is evidence of tissue hypoxia (Riansrithongkham et al., 2025).

NPWT with instillation and dwell time is proposed as an option for infected or biofilm-related ulcers after surgical debridement, with mechanisms involving removal of exudate and improvement of the wound microenvironment (Dalla Paola, 2013). Targeted use of PRP may enhance angiogenesis and extracellular-matrix remodeling, although standardization of dosage and composition is required to limit variability in clinical outcomes (Smith & Rai, 2024). Additional evidence supports individualized NPWT settings or NPWT with instillation in microangiopathy and surgical-site infections (Ioannidis et al., 2025), as well as evidence of benefit for HBOT as an adjunctive approach in DFUs (Sharma et al., 2021). Finally, Sun et al. (2024) reported that low-cost NPWT is not only effective but also reduces the economic burden on patients.

Regarding clinical practice in Greece, despite progress in prevention and treatment, the diabetic foot remains a major problem in the country, creating a need for interdisciplinary structures and standardized care protocols in clinical practice (Papanas & Maltezos, 2009). Greek nursing literature documents that negative pressure is used as an adjunctive method after debridement, if infection and ischemia are controlled, and with clear contraindications when exposed structures or uncontrolled osteomyelitis are present; these conditions guide daily patient selection (Antonakou et al., 2017). More recent Greek reviews highlight the mechanisms of NPWT and the need to individualize settings for each patient, emphasizing combined use with off-loading, infection control, and modern dressings (Petritzikli, 2022). Contemporary Greek clinical reports in patients with microangiopathy demonstrate practical pressure adjustments and the use of systems with instillation as part of a targeted strategy for better granulation and reduced necrosis, which is useful in cases of difficult perfusion (Ioannidis et al., 2025). The domestic scientific community continually highlights issues of organization, prevention, and healing in national conferences, promoting clinical education and common standards of care that facilitate uniform application of NPWT in Greek centers (Hellenic Society for the Study of the Diabetic Foot, 2024).

This systematic review explores the effectiveness of NPWT and VAC negative-pressure therapy in the diabetic foot compared with conventional treatment.

MATERIALS AND METHODS

In this study, a systematic literature review was conducted according to the PRISMA method. To carry out the review, the question was formulated using the PICO framework. The following table (Table 1) presents the PICO elements for the present study.

Table 1. PICO Method

PICO	Analysis
P (Population)	Adults with diabetic foot ulcers (DFUs)
I (Intervention)	NPWT/VAC, alone or combined with other therapeutic methods
C (Comparator)	Conventional local care or other methods
O (Outcome)	healing time, complete closure, granulation tissue, amputation, adverse events, hospital stay, cost

The present systematic review followed the PRISMA 2020 guidelines. The review was not pre-registered in a protocol database such as PROSPERO. An ex-post protocol was prepared before data extraction. Appendix A presents the search strategy, study-selection process, flow diagram, data extraction, risk-of-bias assessment (RoB 2/ROBINS-I), and synthesis plan (narrative synthesis) (Tables 2 and 3).

Table 2. RoB 2 assessment of randomized clinical studies

Study (Year)	D1: Randomization (sequence and concealment)	D2: Deviations from interventions	D3: Missing outcome data	D4: Outcome measurement	D5: Selective reporting	Overall judgement	Documentation
Wu et al., 2023	Low	Some Concerns	Low	Low	Low	**Low**	D1: block randomization and concealment using opaque envelopes/central system. D2: clear protocol/ITT reported, but treatment was not blinded; possible deviations. D3: minimal losses; 50/50 analyzed. D4: outcome assessors blinded (STSG timing/measurement). D5: pre-registration and all outcomes reported.
Seidel et al., 2020	Low	High	High	Low	Low	**High**	D1: central web-based randomization (permuted blocks) and adequate concealment. D2: many deviations/non-adherence events: early discontinuation of NPWT, crossovers (NPWT<->SMWC), infrequent dressing changes (<3/week). D3: high missing data/unconfirmed endpoints, for example absence of closure photographs and early terminations. D4: outcomes measured by blinded assessors (photographic confirmation of closure/measurements). D5: pre-registration and reporting of pre-specified outcomes.
Seidel et al., 2022	Low	High	High	Low	Low	**High**	D1: central web-based randomization, permuted blocks, adequate concealment. D2: many deviations/non-adherence events, including crossovers, early NPWT discontinuations, and care deviations. D3: high missing data/unconfirmed endpoints and extensive exclusions affecting outcomes. D4: outcomes measured by blinded central assessors (photographic confirmation). D5: pre-registered outcomes and complete reporting.
Yadav et al., 2023	Some concerns	Some concerns	Low	Low	Some concerns	**Some concerns**	D1: randomization using a «random table» (Excel), without clear description of concealment. D2: open-label intervention, possible deviations; ITT is not documented. D3: 90 participants ultimately enrolled (5 excluded before enrollment because of COVID); no major missing outcome data reported. D4: outcomes mainly objective (hospital days, number of debridements, cost, healing rate); no blinding, but low risk of measurement bias. D5: no pre-registration/protocol reported; risk of selective reporting.

Maranna et al., 2021	Some concerns	Some concerns	Low	Some concerns	Low	**Some concerns**	D1: simple randomization using computer-generated numbers and sealed-envelope allocation, without clear description of opaque/serially numbered envelopes; possible uncertainty in concealment. D2: non-blinded intervention; ITT not explicitly documented; possible deviations/adherence issues. D3: n=45 (22/23); no substantial missing data reported for main outcomes (14 days/3 months). D4: outcome measurement without blinding; some outcomes subjective, such as percentage granulation, although objective measures were also used (area, hospital days). D5: declared pre-registration and reporting of planned outcomes.
James et al., 2019	Low	Some concerns	Some concerns	Some concerns	Some concerns	**Some concerns**	D1: stratified block randomization (blocks of 4/6) with serially numbered opaque sealed envelopes for concealment. D2: open-label intervention; ITT not explicitly documented; possible deviations/adherence issues. D3: 30 and 27 analyzed per group (approximately 10% losses per arm), without full clarity on handling missing data. D4: non-blinded measurement for some subjective endpoints, such as granulation score and VAS, although objective measures were also included. D5: no pre-registration/protocol reported; possible risk of selective reporting.
Anjum et al., 2022	Some concerns	Some concerns	Low	High	Some concerns	**High**	D1: randomization using «random tables», without clear description of concealment. D2: open-label intervention; ITT not documented; possible deviations/adherence issues. D3: 20/20 randomized and analyzed in each group, essentially without missing data. D4: the primary outcome, appearance of granulation at 2 weeks, is partly subjective, and assessor blinding is not reported. D5: no pre-registration/protocol reported; risk of selective reporting.
Mousa et al., 2020	Some concerns	Some concerns	Low	Some concerns	Some concerns	**Some concerns**	D1: «randomly classified» without details on method/ concealment. D2: open-label intervention; ITT not documented; possible deviations. D3: no substantial missing data/losses reported by outcome. D4: non-blinded measurement; outcomes include time to granulation and number of debridements. D5: no pre-registration/protocol reported; risk of selective reporting.

Table 3. ROBINS-I assessment of non-randomized comparative studies

Study (Year)	D1: Confounding	D2: Selection of participants	D3: Classification of interventions	D4: Deviations from interventions	D5: Missing data	D6: Outcome measurement	D7: Selective reporting	Overall judgement	Documentation
Sukur et al., 2018	Serious	Moderate	Low	Low	Moderate	Moderate	Moderate	**Serious**	Confounding: non-randomized, possible confounding (Wagner grade, ischemia/infection, off-loading, glycemic control) without adjustment. Selection: clear inclusion criteria, but non-randomized allocation to groups. Classification of interventions: VAC versus moist dressings clearly defined. Deviations from intended interventions: no major deviations described. Missing data: losses/handling not documented in detail. Measurement of outcomes: no blinding; the outcome of "90% granulation" is potentially subjective. Selective reporting: no pre-registration; possible selective reporting.
Kotennavar et al., 2022	Serious	Moderate	Low	Moderate	Moderate	Serious	Moderate	**Serious**	Confounding: alternating allocation to four groups (NPWT/collagen/off-loading/conventional), without adjustment for key confounders such as Wagner grade, ischemia/infection, off-loading, and glycemic control. Selection of participants: prospective inclusion of all DFU grades 1-3 in one center; alternating allocation permits possible selection according to case flow. Classification of interventions: interventions are clearly defined and applied as distinct groups. Deviations from intended interventions: common co-interventions such as insulin therapy, antibiotics, and debridement, but adherence/standardization by group is not documented. Missing data: loss/handling of data during follow-up is not explicitly described; completeness is unclear. Measurement of outcomes: open-label study without blinding; outcomes such as percentage granulation/»good outcome» are partly subjective. Selective reporting: no pre-registration/protocol reported; risk of selective reporting.

Hu et al., 2018	Serious	Moderate	Low	Moderate	Moderate	Moderate	Moderate	**Serious**	Confounding: non-randomized comparison, possible baseline differences (Wagner grade, size, infection/ischemia, glycemic control), without adjustment. Selection: single-center study, clear inclusion criteria but no randomization. Classification: interventions clearly defined (VAC versus VAC plus photon therapy). Deviations: open-label care; co-interventions such as debridement/ antibiotics not fully standardized by group. Missing data: losses and their handling are not documented in detail. Measurement: no blinding; some endpoints potentially subjective, such as VAS and frequency of dressing changes. Selective reporting: no pre-registration/ protocol reported.

Protocol finalization date: 01/10/2025.

Deviations from the protocol are documented in the same Appendix and highlighted in the text where applicable. More specifically:

1. Alignment of the population with DFUs, excluding non-DFU studies such as abdominal or other surgical wounds.
2. Search time frame: from [01/01/2018] to [31/12/2024].
3. Combined interventions, such as NPWT plus PRP or phototherapy, were pre-specified for subgroup analysis.

The search was conducted in valid databases, specifically PubMed and Scopus. The inclusion criteria for the studies were as follows:

1) Articles published from 1/1/2018 to 31/12/2024.
2) Studies published in English.
3) Studies examining NPWT and/or VAC in relation to conventional methods for the treatment of diabetic foot.

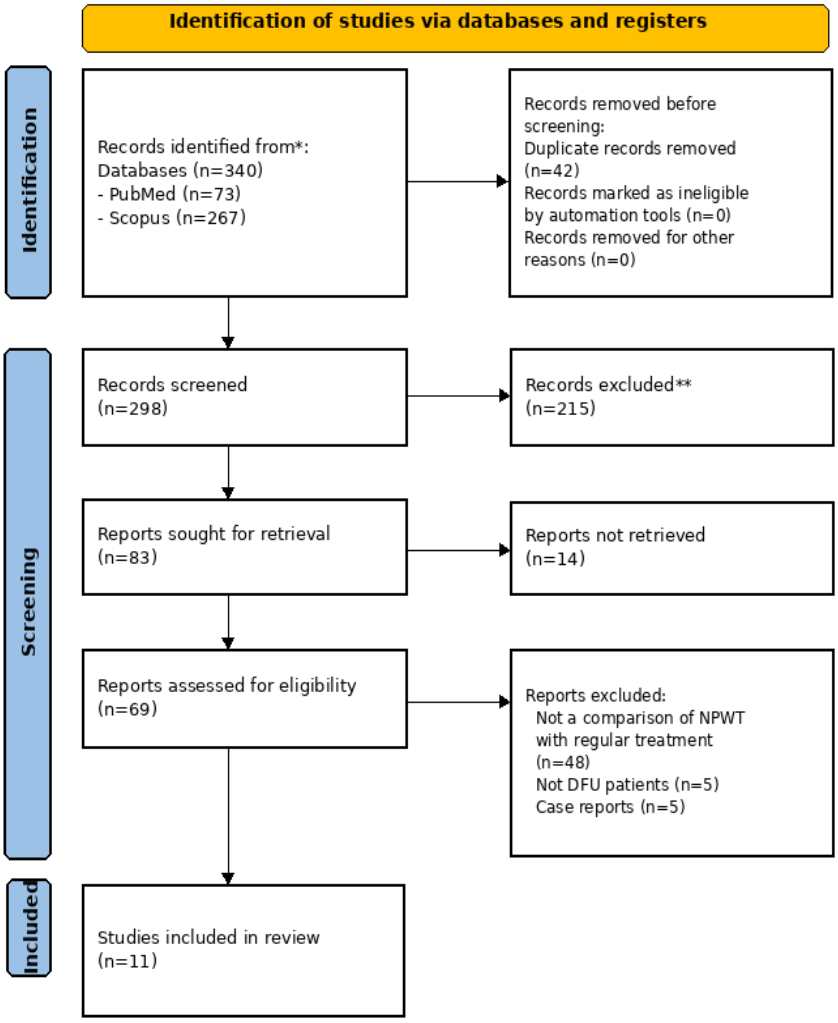
The period 2018-2024 was selected to focus on contemporary applications of NPWT in DFUs after the widespread dissemination of commercially available systems and the standardization of basic care practices. Studies conducted before 2018 may have used older generations of devices or protocols and may not reflect current clinical practice.

The exclusion criteria applied were as follows:

1) Studies concerning non-diabetic foot ulcers, such as abdominal wounds or wounds at other sites.
2) Case reports or case series without a comparison group.
3) Pediatric studies.
4) Studies conducted before 2018.
5) Studies published in a language other than English.

Detailed information on the search strategy followed is provided in Appendix A. The search yielded 73 results in PubMed and 267 in Scopus. The flow diagram shows in detail how the 11 studies included in the review were selected.

PRISMA 2020 Flow Diagram



RESULTS

Comparison of NPWT (VAC) Alone Versus Conventional Methods

Table 4 presents the seven studies that compared the negative-pressure VAC method alone with conventional methods for the treatment of diabetic foot.

The study by Sukur et al. (2018) aimed to compare the effectiveness of negative-pressure wound therapy (NPWT) with conventional moist wound dressings in the treatment of diabetic ulcers following partial foot amputation. Based on the results, the researchers concluded that VAC appears to be an effective treatment for patients with diabetic foot who had previously undergone partial foot amputation (Sukur et al. 2018).

James et al. (2019) conducted a randomized controlled trial that included patients with Wagner grade 1 and 2 diabetic foot ulcers. Patients were divided into two groups according to ulcer size, DFU <10 cm and DFU >=10 cm, and then randomly received VAC therapy or conventional dressing. Healing time, granulation-tissue formation, and complications were compared between the two groups. The researchers concluded that VAC therapy significantly reduces ulcer healing time, accelerates granulation-tissue formation, and reduces ulcer area compared with conventional dressing, while no complications were observed in the VAC treatment group (James et al. 2019).

The study by Maranna et al. (2021) aimed to compare negative-pressure therapy with conventional saline dressings in the healing of diabetic foot ulcers. Granulation-tissue formation, reduction in ulcer size, length of hospitalization, and time to complete wound healing were assessed. The researchers concluded that ulcer size was reduced, more granulation tissue was formed, hospitalization was shorter, and complete ulcer healing was achieved (Maranna et al. 2021).

The study by Anjum et al. (2022) aimed to compare the outcomes of VAC with conventional wound dressing in the treatment of diabetic foot ulcers. A randomized controlled trial was conducted in the Department of Surgery at Services Hospital, Lahore, over six months. Forty patients with diabetic foot ulcers were included and randomly allocated to two groups. Group A received VAC dressing using adhesive material to create an airtight seal, while the conventional group received daily saline-soaked gauze dressing. Patients were followed for two weeks to assess the appearance of granulation tissue, the primary outcome measure. The VAC group showed a significantly shorter mean wound-healing duration (7.50 +/- 2.82 days) compared with the conventional group (10.60 +/- 5.55 days) ($p<0.05$). All 20 patients (100%) in the VAC group achieved treatment success, whereas only 13 patients (65%) in the conventional group achieved complete healing within two weeks and 7 patients (35%) did not. This difference was statistically significant ($p<0.05$). VAC therapy proved more effective in promoting granulation-tissue formation and accelerating wound healing in patients with diabetic foot ulcers compared with conventional dressing methods, indicating its potential as a superior therapeutic option (Anjum et al. 2022).

In the multicenter study by Seidel, Lefering, and the DiaFu study group (2022), conducted between 23 December 2011 and 21 October 2014, 368 adults with diabetic foot ulcers were randomly assigned to receive either NPWT or conventional therapy. The evaluation focused on direct resource use, including treatment times in hospitals and outpatient clinics, staff time, and materials used for wound care over 16 weeks. Resource analysis primarily involved the per-protocol population (NPWT 44, SMWC 110). The results showed that NPWT significantly reduced treatment duration by an average of 16 days compared with SMWC, while outpatient treatment was also 14.9 days shorter with NPWT (mean (SD) 68.3 (31.1) days versus 83.2 (29.7) days). Although the number of dressing changes per participant tended to be lower with NPWT, the time per dressing change was significantly shorter with SMWC. In addition, NPWT reduced the time spent on surgical procedures per participant by 23.3 minutes compared with SMWC. NPWT demonstrated lower resource use than SMWC, suggesting that it could be an effective treatment option for diabetic foot wounds. However, further cost analyses are required to fully assess its economic benefits (Seidel & Lefering 2022).

The randomized controlled trial by Wu et al. (2023), conducted between September 2022 and March 2023 at Nanjing First Hospital and PLA 454 Hospital, compared negative-pressure wound therapy (NPWT) with alginate dressings for wound-bed preparation before split-thickness skin graft (STSG) surgery in patients with chronic diabetic foot ulcers. The study included 100 patients divided into two groups: NPWT (n=50) and alginate dressings (n=50). The results showed that the NPWT group reached the stage for STSG surgery faster than the control group. In addition, patients receiving NPWT showed higher skin-graft survival rates, increased wound perfusion, and reduced formation of neutrophil extracellular traps (NETs). Furthermore, macrophages in DFU wounds shifted from the pro-inflammatory M1 phenotype to the anti-inflammatory M2 phenotype in the NPWT group. These findings indicated that NPWT is more effective than conventional moist dressings in preparing the wound bed for STSG surgery in patients with chronic DFUs (Wu et al. 2023).

Table 4. Review results - studies on the effectiveness of NPWT versus conventional methods

Author - Year - Country	Type of study - Sample - Methodology	Results	Conclusions	Limitations
James et al. 2019, South India	RCT (n=60) Study duration: 2 years Wagner grade 1 and 2 DFUs, grouped according to DFU size <10 cm and >=10 cm. Treatment with VAC or conventional dressing.	Mean healing time was shorter in the VAC group (22.52 versus 3.85, P < 0.0001). Mean time to 75%-100% coverage by granulation tissue was shorter (23.33 VAC versus 32.15; P < 0.0001), with a better rate of formation (2.91 cm2/day versus 2.16 cm2/day; P = 0.0306). No complications. VAC was associated with significantly less pain in week 3 (scale 3 versus 4; P = 0.004).	VAC heals ulcers more quickly, accelerates granulation-tissue formation, and reduces ulcer surface area.	Small sample; cost, quality-of-life factors, and patient satisfaction should be evaluated.
Sukur et al. 2018 Turkey	RCT (n=65) Comparison of VAC effectiveness with conventional moist dressings for treating diabetic foot ulcers in patients who had previously undergone partial foot amputation. Group A: (n=31) Group B: (n=32) Study duration: 3 months	The mean time to achieve 90% granulation tissue was significantly lower in group A (7.8 +/- 1.2 weeks versus 11.1 +/- 1.2, p < 0.001). There was no significant difference in reoperation requirements: 38.7% (n=12) in group A and 41.2% (n=14) in group B (p = 0.839).	VAC is an effective treatment for patients who had previously undergone partial foot amputation.	Lack of weekly granulation data. Patients' gait pattern was not analyzed.
Maranna et al. 2021 India	Prospective RCT (n=45) Comparison of VAC effectiveness with conventional saline dressings for treating diabetic foot ulcers. Study duration: 3 months	Granulation-tissue formation (91.14 versus 52.61%, p < 0.001) and ulcer-size reduction (40.78 versus 21.18%, p = 0.008) at 14 days were greater in group A. Hospital stay was 15.68 versus 29.00 days (p < 0.001), and time to 100% healing with granulation tissue was 14.82 +/- 7.30 versus 44.57 +/- 7.11 days (p < 0.001), lower in group A. Complete wound healing at 3 months occurred in 20 patients (90.9%) in group A and in 6 patients (26.1%) in group B (p = 0.006).	Early reduction in ulcer size, granulation-tissue formation, shorter hospitalization, and complete ulcer healing.	Not all factors affecting diabetic-foot ulcer treatment were examined.
Seidel et al. (2020a) Germany	Controlled clinical superiority trial with blinded outcome assessment 368 patients and 345 intention-to-treat participants Comparison of NPWT with standard wound care	Wound-healing rate (difference: n=4; 2.5% (95% CI -4.7% to 9.7%); p=0.53) and time to wound healing (p=0.244) differed significantly between treatment arms.	NPWT was not more effective than conventional care in German practice. The wound-healing rate was low.	Insufficient documentation and deviations from treatment guidelines negatively affected the wound-closure outcome.

Anjum et al. 2022 Pakistan	RCT (n=40) Comparison of NPWT with conventional dressing therapy in diabetic foot ulcers based on granulation-tissue healing in two randomized patient groups. Study duration: 6 months	In the NPWT group, mean healing duration was 7.50 +/- 2.82 days. In the conventional group it was 10.60 +/- 5.55 days ($p<0.05$). In the VAC group, 100% healed. In the conventional group, 13 healed, whereas the remaining patients did not achieve complete healing within 2 weeks ($p<0.05$).	NPWT-VAC was more effective for tissue granulation compared with conventional dressing.	Not reported.
Seidel, Lefering & DiaFu 2022 Germany	Multicenter study 368 adults randomly allocated to NPWT and conventional therapy. Assessment of treatment time and materials over 16 weeks.	Treatment was 16 days shorter with NPWT (mean (SD) 82.8 (31.6), SMWC 98.8 (24.6), U test, $p = 0.001$). Fewer dressings per participant were used with NPWT (mean (SD) 35.1 (18.6), SMWC 42.9 (21.4), U test, $p = 0.067$). Time per dressing change differed significantly between SMWC (mean (SD) 19.7 (12.8)) and NPWT (16.5 (8.2) minutes; U test, $p < 0.0001$).	Resource use was lower for NPWT, which may be an effective alternative treatment to SMWC for diabetic foot wounds, to be confirmed in subsequent cost analyses.	Not reported.
Wu et al. (2023) China	Randomized controlled trial. Patients were divided into two groups: NPWT (n=50) and a control group treated with alginate dressings (n=50). When the DFU was filled with healthy granulation tissue, STSG surgery was performed.	The NPWT group required less time to reach STSG surgery than the control group. The NPWT group had markedly increased skin-graft survival rates, increased wound perfusion, and reduced NET formation compared with the control group. Macrophages in DFUs changed from the M1 phenotype to the M2 phenotype in the NPWT group.	VAC is superior to conventional moist dressings for wound-bed preparation before STSG surgery in patients with chronic DFUs.	Not reported.

Comparison of Combined Methods

Table 5 presents the four studies that either compare therapies combining NPWT and VAC or compare a third method together with VAC and conventional therapy.

The study by Mousa et al. (2020) compared the outcomes of VAC, hyperbaric oxygen therapy (HBOT), and traditional moist dressings in improving the healing of chronic diabetic foot infection. Ulcers were assessed weekly for six weeks for size, time to formation of healthy granulation tissue, complications, and number of debridement sessions. VAC therapy was presented as safer and more effective, with fewer complications than the other two methods, and it may be used concurrently with HBOT (Mousa et al. 2020).

The study by Hu et al. (2020) was conducted to investigate the effectiveness of VAC therapy combined with phototherapy for the management of DFUs. Both VAC therapy and the combination of VAC with phototherapy were effective and safe in the treatment of DFUs, while the combined therapy may have accelerated wound healing without affecting long-term effectiveness (Hu et al. 2020).

The study by Kotennavar et al. (2022) aimed to compare the effectiveness of vacuum-assisted NPWT, collagen granules, and off-loading techniques with conventional moist gauze dressings in the treatment of DFUs. It examined demographic characteristics, types of foot lesions, and treatment outcomes across different dressing methods. Patients were allocated alternately to one of four groups, with 50 cases in each group. The results showed a gradual increase in granulation-tissue development in all groups, with the collagen-dressing group showing the most significant improvement from the first week. Early recovery was more pronounced in the NPWT, collagen, and off-loading groups compared with the conventional method. Mean recovery time was lowest in the collagen-dressing group. Positive outcomes were observed in 90% of the NPWT group, 92% of the off-loading group, and 96% of the collagen group, whereas only 64% of the conventional group had favorable outcomes. The differences were statistically significant. The study found that collagen dressing was superior for treating diabetic foot ulcers, followed by off-loading techniques and NPWT. Conventional moist gauze dressings led to less favorable and slower outcomes (Kotennavar et al. 2022).

In the study by Yadav et al. (2023), the effectiveness of conventional dressings, foam dressings, and negative-pressure therapy (VAC) in the management of diabetic foot ulcers was evaluated. Treatment duration, number of debridements, need for another intervention, treatment cost, and length of hospital stay were compared between groups. The researchers concluded that VAC is the best treatment for faster healing and shorter hospital stay. Foam dressing provides an economically viable option with better outcomes than conventional dressing (Yadav et al. 2023).

Table 5. Review results - studies on the effectiveness of NPWT combined with other therapeutic interventions versus conventional methods

Author - Year - Country	Type of study - Sample - Methodology	Results	Conclusions	Limitations
Hu et al. 2018 China	RCT (n=69) Comparison of VAC combined with phototherapy in DFUs among patients at Wagner stage 2 or 3, divided into two groups: the VAC group (n=35) and the combined group, in which patients received VAC and phototherapy (n=34). Study duration: 2 years	Treatment duration and dressing-change times were shorter in the combined group compared with the VAC group ($P < 0.05$). The reduction in ulcer surface area did not show a significant difference between the two groups.	VAC and VAC combined with phototherapy were effective and safe; the combination may have accelerated wound healing and did not affect long-term effectiveness.	Not reported.
Mousa et al. 2020 Egypt	Prospective randomized study (n=75) Comparison of outcomes of VAC, HBOT, and traditional moist dressings in healing chronic diabetic-foot infection. Group A (n=25): VAC Group B (n=25): HBOT Group C (n=25): conventional moist dressings Study duration: 6 weeks	Ulcer-size reduction averaged 70.25% in group A, 62.65% in group B, and 32.46% in group C. Onset of healthy granulation-tissue formation was faster in group A, with a mean of 6.5 days, compared with 7 days in group B and 14 days in group C. Debridement sessions and complications were fewer with VAC.	VAC is safe and more effective, with fewer complications than the other two methods, and it may be used concurrently with HBOT when indicated.	Not reported.

Kotennavar et al. (2022) India	Comparison of vacuum-assisted NPWT, collagen granules, and off-loading techniques with conventional dressings. Four patient groups with 50 cases in each group.	Gradual increase in granulation-tissue development in all groups, with the collagen-dressing group showing the most significant improvement from the first week. Early recovery was more pronounced in the NPWT, collagen, and off-loading groups compared with the conventional method. Mean recovery time was lower in the collagen-dressing group. Positive outcomes were observed in 90% of the NPWT group, 92% of the off-loading group, and 96% of the collagen group, whereas only 64% of the conventional group had favorable outcomes. The differences were statistically significant.	Collagen dressing is superior for treating diabetic foot ulcers, followed by off-loading techniques and NPWT. Conventional moist gauze dressings led to less favorable and slower outcomes.	Not reported.
Yadav et al. (2023) India	RCT (n=90) Search for the optimal treatment for diabetic foot ulcers. Group 1: conventional dressing (n=30) Group 2: foam dressing (n=30) Group 3: VAC (n=30) Study duration: 3 years	Mean number of debridements: group 1, 2.37; group 2, 2.43; group 3, 1.60. Mean hospital stay: group 1, 31.17 days; group 2, 24.13 days; group 3, 15.17 days.	VAC is the recommended treatment for faster ulcer healing. Foam dressing is a more economical treatment with better outcomes than conventional dressing.	Not reported.

DISCUSSION

Based on the above results, several important conclusions can be drawn regarding the method and the healing of diabetic foot ulcers. Firstly, the NPWT and VAC negative-pressure methods appear to offer significant advantages across the parameters examined for the diabetic foot. Interestingly, in the studies included in this work, healing time appears to be much shorter than with conventional methods. The same applies to granulation-tissue formation. It is also important to note that, in the intervention group of many studies, faster granulation or wound-bed preparation with NPWT was observed, while complete closure was not consistently superior to conventional care. It is also noteworthy that, in one of these studies, bacteria were absent from most ulcers.

More specifically, in the section of studies included in the research table comparing NPWT with conventional methods, several studies were identified that investigated the effectiveness of NPWT compared with conventional wound dressings in the treatment of diabetic foot ulcers (DFUs). Sukur et al. (2018) focused on patients who had undergone partial foot amputation because of diabetes and concluded that NPWT showed effectiveness in wound healing compared with conventional dressings. Similarly, James et al. (2019) conducted an RCT among patients with Wagner grade 1 and 2 DFUs and found that NPWT significantly reduced wound-healing time, promoted granulation-tissue formation, and reduced ulcer size compared with conventional dressings, without increased complications. In another multicenter study by Seidel, Lefering, and the DiaFu study group (2022), NPWT demonstrated significant reductions in treatment duration, resource use, and surgical procedure time compared with standard moist wound care (SMWC) for diabetic foot wounds, while requiring fewer dressing changes and lower resource use.

NPWT appears consistently effective in accelerating diabetic foot wound healing, promoting granulation-tissue formation, and reducing ulcer size in diabetic foot ulcers compared with conventional dressings. However, it also carries a risk of increased wound-related adverse events, which should be considered in clinical practice. The application of NPWT in diabetic foot ulcers is indicated mainly for postoperative wounds or when optimal basic care is insufficient, with mandatory systematic debridement, off-loading, infection control, and assurance of adequate perfusion or prior revascularization within an interdisciplinary framework (IWGDF, 2023). Pressures of approximately 125 mmHg are recommended, with continuous operation during the first 48-72 hours and intermittent operation during the granulation phase, dressing changes every 48-72 hours, and use of a non-adherent layer to protect vulnerable structures (Solventum). Unresolved osteomyelitis, extensive necrosis without adequate debridement, and direct foam contact with exposed vessels or nerves are contraindications, while monitoring should focus on timely granulation and readiness for skin grafting

where indicated (IWGDF, 2023; Solventum).

Regarding the studies included in the section on combined methods, VAC consistently emerged as an effective therapy for DFUs, promoting faster wound healing, reducing complications, and offering potential advantages over other methods such as HBOT, collagen dressings, and traditional dressings. NPWT also demonstrated significant benefits, particularly in preparing wounds for surgical procedures and improving skin-graft outcomes.

Although VAC and NPWT were often associated with better outcomes, considerations of cost-effectiveness and practicality were evident, with studies such as Yadav et al. (2023) highlighting foam dressings as a viable alternative with favorable outcomes. Combined therapies, such as VAC with phototherapy (Hu et al., 2020), indicated favorable results in enhancing therapeutic effectiveness without compromising patient safety and health. In the theoretical framework, combinations of NPWT with PRP, HBOT, or instillation appear promising for rapid granulation and wound-bed preparation. In the present review, however, the available comparative data on combined approaches are limited, heterogeneous, and often non-randomized, with risk of bias and inconsistent outcomes. Well-designed randomized studies are needed to define clear indications, standardized protocols, and meaningful outcomes so that targeted and truly effective combinations can be identified.

Regarding the economic dimension of treatment in Greece, the orientation toward hospital-based application of NPWT should take into account disease burden, reimbursement mechanisms, and the realistic cost of consumables. Official announcements consistently highlight a high annual number of amputations, underscoring the need for effective interventions and organized care pathways (Ministry of Health, n.d.). Within the existing KEN-DRG framework, the direct hospital cost of admissions for DFUs is captured in Greek analyses and may serve as a reference point for evaluating NPWT programs (University of Athens, n.d.). At the same time, procurement records in Diavgeia provide indicative prices for NPWT systems and consumables, allowing episode-level cost estimates based on actual hospital purchases (Diavgeia, n.d.). From a clinical perspective, resource-use data from a randomized study in DFUs show differences in treatment times and outpatient care in favor of NPWT in some arms, providing a comparative background for economic discussion, even outside the Greek system (Seidel et al., 2022). Overall, systematic documentation of NPWT cost-effectiveness in Greece should be based on KEN-DRG, actual procurement prices, and primary recording of hospitalization days, with clear alignment to EOPYY reimbursement (Government Gazette KEN-DRG; Diavgeia).

In general, with respect to combined methods, NPWT combined with phototherapy appears to perform better in relation to treatment duration and the time required for dressing changes, although not in relation to ulcer surface area. This could therefore justify further clinical studies examining the combination of these two methods. In studies in which a third method was applied in addition to conventional treatment and VAC, such as foam dressing or HBOT, VAC was again considered more effective for faster ulcer healing and fewer complications.

Despite the above, certain limitations should be considered. Although NPWT is not a new wound therapy, more quantitative and qualitative studies are required to fully clarify its scope of action and improve patient tolerance. In summary, the risk-of-bias assessment showed heterogeneous quality among randomized controlled trials: Wu 2023 was assessed as Low risk, several trials such as Maranna 2021, James 2019, Yadav 2023, and Anjum 2022 as Some concerns, and DiaFu (Seidel 2020/2022) as High because of extensive deviations and incomplete data. Non-randomized comparative studies such as Sukur 2018, Kotennavar 2022, and Hu 2018 were mainly classified as Serious, primarily because of confounding and outcome-measurement concerns. This suggests that, although NPWT shows favorable trends compared with conventional care, especially regarding time and wound-bed preparation, findings should be interpreted cautiously because of risk of bias and methodological heterogeneity. In addition, companies and organizations that manufacture related medical devices should improve device size and autonomy so that the devices are more tolerable for patients and do not restrict their daily lives.

CONCLUSIONS

The findings of the present literature review showed that NPWT is an effective and safe treatment for diabetic foot ulcers in affected patients. In addition, this therapy was found to be more effective than conventional dressings and resulted in healthier granulation-tissue formation and reduction of wound extent in all dimensions. All studies examined in the present review followed a comparative research methodology between negative-pressure therapy/VAC and other conventional treatments, such as simple saline-soaked dressings. All 11 studies concluded that NPWT is a more effective and faster treatment for ulcer healing, also helping accelerate granulation-tissue development in the wound and ultimately reducing the length of hospitalization for patients with diabetes.

In conclusion, although negative-pressure therapy remains a first-line treatment for DFUs in patients with diabetes because of its effectiveness and safety, ongoing research aims to optimize treatment strategies by exploring combined therapies and evaluating their long-term benefits and economic implications for clinical practice and patient support.

Hospitals and, more broadly, clinical practices and protocols should consider VAC therapy a core method for managing diabetic foot wounds, while research could focus on examining the effectiveness of combined intervention methods with VAC. Although NPWT shows clear benefits in wound healing, future studies should continue to investigate and mitigate the risk of adverse events associated with NPWT. This includes understanding patient-specific factors that may predispose individuals to complications and developing strategies to minimize

these risks.

Comprehensive cost-effectiveness analyses would also provide valuable information on the economic impact of NPWT compared with conventional dressings. Understanding the long-term economic benefits and health-care resource use associated with NPWT could inform health-care decision-making and reimbursement policies. At the research level, future work could explore personalized-medicine approaches to optimize NPWT outcomes based on individual patient characteristics, such as wound severity, comorbidities, and response to treatment. Tailoring NPWT protocols could potentially enhance treatment effectiveness and reduce complications. Preliminary evidence indicates that NPWT is at least as effective as, if not better than, current topical wound treatments. This also applies to the use of low-cost improvised negative-pressure suction systems. However, the generalizability of cost and effectiveness data is limited by differences in treatment conditions and health-care systems.

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APPENDIX [A]

Methods: Sources and Search Strategy

The search was conducted in MEDLINE/PubMed and Scopus for the period 1/1/2018-31/12/2024. The final update of the search and study selection was performed on 01/10/2025. The full search strings by database, including fields, Boolean operators, and dates, are provided in the Appendix (PRISMA-S). Combinations of controlled terms (MeSH) and keywords (tiab) were used.

PRISMA-S Searches

PubMed (MEDLINE) - Final execution: 01/10/2025; Limits: 2018-2024; Access filters: Free full text, English, Humans, Exclude preprints, from 2018/1/1 to 2024/12/31

Fields: MeSH + Title/Abstract (tiab)

(("Negative-Pressure Wound Therapy"[MeSH Terms]
OR "Vacuum-Assisted Closure"[All Fields]
OR "negative pressure wound*"[Title/Abstract]
OR "vacuum-assisted"[Title/Abstract]
OR "vacuum assisted"[Title/Abstract]
OR NPWT[Title/Abstract]
OR VAC[Title/Abstract])

AND

("Diabetic Foot"[MeSH Terms]
OR "diabetic foot ulcer*"[Title/Abstract]
OR "diabetic foot"[Title/Abstract]
OR DFU[Title/Abstract]))
AND ("2018/01/01"[Date - Publication] : "2024/12/31"[Date - Publication])
AND (ffrft[Filter])
AND (excludepreprints[Filter])
AND (humans[Filter])
AND (english[Filter])

Scopus - Final execution: 01/10/2025; Years: 2018-2024; Access filters: Range 2018-2024, Article, Final, Journal, English, All open access

Fields: TITLE-ABS-KEY

(TITLE-ABS-KEY("negative pressure wound*" OR "vacuum-assisted" OR "vacuum assisted" OR NPWT OR VAC)
AND TITLE-ABS-KEY("diabetic foot ulcer*" OR "diabetic foot" OR DFU))
AND (PUBYEAR > 2017 AND PUBYEAR < 2025)
AND (LIMIT-TO(LANGUAGE, "English"))
AND (LIMIT-TO(DOCTYPE, "ar"))

Retrieval dates: initial search 12/01/2025; final update 01/10/2025

Selection process:

Screening of titles/abstracts and full texts was performed manually by one reviewer according to predefined criteria. No automation tools were used.

Deduplication:

Records were merged and duplicates were removed manually by matching Title/First author/Year/DOI/PMID. The final number of duplicates is shown in the PRISMA flow diagram below.

Data extraction:

One reviewer extracted data using a standardized form: design, country, n, patient characteristics/ulcer grade, NPWT settings and any combinations, comparator, outcomes, and follow-up.

Risk of bias:

Assessment was performed using RoB 2 for randomized controlled trials and ROBINS-I for non-randomized studies, as shown below.

Effect measures and synthesis:

Dichotomous outcomes were expressed as RR/OR (95% CI) and continuous outcomes as MD/SMD (95% CI). A narrative synthesis was selected because of heterogeneity and the limited number of studies per outcome. No meta-analysis was performed.

Publication bias and certainty:

Publication-bias testing (funnel/Egger) was not performed because there were fewer than 10 studies per outcome and no meta-analysis was conducted.

REVIEW

Recognition of Defense Mechanisms in Individuals with Alcohol Use Disorder: Nursing Approaches

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ABSTRACT

Alcohol use disorder is an urgent public health challenge worldwide, as alcohol is the most commonly used psychoactive substance. This creates a need for collaboration within a multidisciplinary team, including mental health nurses, in order to identify and implement the most effective therapeutic strategies. The aim of this descriptive review is to explore the defense mechanisms used by individuals with alcohol use disorder to manage difficult emotional states and maintain a positive self-image. These mechanisms are divided into primitive and developed mechanisms, with the former often leading to avoidance of behavioral change and to justification of the substance use disorder. Studies show that certain mechanisms are associated with alcohol consumption. Mental health nurses play a critical role in supporting and guiding individuals with alcohol use disorder by strengthening the therapeutic relationship and identifying resistance to treatment. Understanding defense mechanisms is essential for predicting the course of the disorder and improving therapeutic approaches. By incorporating this knowledge into practice, nurses can contribute to the development of effective interventions and supportive structures for the mental and physical health of these individuals.

Keywords: alcohol use disorder, defense mechanisms, mental health nurses.

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INTRODUCTION

Alcohol use disorder is a serious public health issue and is among the major risk factors for health problems worldwide. According to the World Health Organization (WHO), 2.6 million deaths were recorded in 2019, with a substantial proportion involving young people (World Health Organization 2025).

According to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), alcohol use disorder ranges from mild to severe, with withdrawal and dependence symptoms constituting key indicators of the condition. These individuals face serious psychological, physical, and social problems, such as increased risk of liver and cardiovascular diseases, mental disorders, and dysfunctional interpersonal relationships. Due to the multidimensional nature of the disorder, a comprehensive approach is required to understand and address it (Nehring et al 2024).

Defense mechanisms are unconscious psychological mechanisms that enable individuals with alcohol use disorder to manage difficult emotional states in order to form a positive self-image. These mechanisms may operate protectively or maladaptively, influencing the course of the condition. This distinction falls into two categories: primitive and developed mechanisms. The use of primitive mechanisms often leads individuals to avoid change, overlook the consequences of their behavior, and justify excessive alcohol consumption. Studies show that, although many different mechanisms can be activated, certain ones are closely linked to consumption (Creswell 2021).

In psychiatric nursing, recognizing and managing the defense mechanisms used by individuals is vital. The focus can be on understanding the psychological mechanisms that contribute to the maintenance of alcohol consumption (Taurino et al 2021). Mental health nurses, who are often on the front line of therapeutic care, play a key role in supporting and guiding these individuals. A more thorough understanding of these mechanisms helps strengthen the therapeutic relationship, identify possible resistance to treatment, and promote positive behavioral change. In addition, they play a critical role in care by providing support, education, and interventions aimed at improving patients' mental and physical health (Spirito et al 2009).

This article aims to analyze the various defense mechanisms used by individuals with alcohol use disorder, focusing on two main categories:

- Primitive mechanisms, such as denial, repression, and regression.
- Developed mechanisms, such as rationalization and compensation.

Investigating these specific defense mechanisms is essential for understanding the disorder, predicting its course, and improving therapeutic approaches. By integrating this knowledge into psychiatric nursing practice, professional mental health nurses can contribute meaningfully to the development of more effective interventions and supportive structures, with the aim of enhancing recovery and improving the quality of life of these individuals.

DEFENSE MECHANISMS

Sigmund Freud, known as the father of psychoanalysis, was the first to develop the theory of defense mechanisms in the late 19th century, focusing on the unconscious processes of the Ego, the Superego, and the Id. In the 20th century, his daughter, Anna Freud, proceeded to a more structured and detailed analysis of these mechanisms, recording ten basic forms of defense, which were later expanded by other psychoanalysts (Cramer 2015).

According to Anna Freud, defense mechanisms are unconscious processes of the Ego used to reduce psychological anxiety. Individuals tend to develop these mechanisms in order to manage internal conflicts, especially between the Superego and the Ego, thereby reducing psychological tensions (Pareth et al 2010).

During the transition from childhood to adolescence and later to adulthood, defense mechanisms may either be maintained, reappear under the influence of stressors, or evolve over time (Cramer et al 2015). Recognizing defense mechanisms, particularly in adolescence, may also help predict the future development of personality disorders. Therefore, their early detection has significant clinical value. Depending on context and severity, defense mechanisms may be either adaptive or maladaptive (Perry 2014).

Psychological interventions, implemented by both clinical psychologists and mental health nurses, help individuals understand their unconscious processes. By recognizing these mechanisms, they can enhance their self-awareness and gain a new perspective on their behavior. This knowledge can be particularly useful for individuals experiencing mental disorders, such as depression, anxiety, eating disorders, and personality disorders (Carrol et al 2017).

An in-depth understanding of defense mechanisms can help mental health nurses adapt their therapeutic approaches and avoid obstacles. For example, recognizing defense mechanisms during a session can facilitate the maintenance of an effective therapeutic and professional relationship (Boeker H. et al 2013).

THE USE OF PRIMITIVE DEFENSE MECHANISMS IN ALCOHOL USE DISORDER

The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), defines defense mechanisms as 'automatic psychological processes that protect the individual from anxiety and from awareness of internal or external dangers or stressors'.

Primitive Defense Mechanisms: These defenses

are characterized by the boundary between the self and the external world (Bailey & Pico, 2023). Primitive defense mechanisms are early, unconscious, less adaptive mechanisms that the individual usually uses from infancy and childhood. They are characterized by their primitive nature and their tendency to distort reality. They often lead to dysfunctional behaviors and psychological distress. Individuals who use primitive defense mechanisms often worsen their alcohol consumption and limit their ability to engage in healthy behaviors (Sayette 2017).

Recognition and management of these primitive defense mechanisms constitute a core element of therapeutic work, as they help individuals develop more effective and adaptive coping strategies, ultimately contributing to abstinence (Costa & Brody 2013).

Denial as a primitive defense mechanism in individuals with alcohol use disorder.

Denial: Denial is a process in which the individual, at the moment when they express thoughts, desires, or feelings that they had previously suppressed, continues to resist them by refusing to acknowledge them as their own (Bailey & Pico, 2022).

Denial is a common defense mechanism in individuals with alcohol use disorder, as they may not recognize the need for changes in their behavior. Denial can hinder help-seeking or participation in therapeutic processes. It manifests as an inability to recognize the severity of their condition or the negative consequences resulting from alcohol consumption (Stodded & Rigue 2010). A characteristic example of this denial is when an individual tells friends or relatives that they do not have a problem with alcohol, saying: 'I do not have a drinking problem. I can stop whenever I want.'

Repression as a primitive defense mechanism in individuals with alcohol use disorder.

Repression: This is an unconscious process that prevents the emergence of ideas or impulses considered undesirable. This defense mechanism may be observed in individuals who have no memory of a traumatic event, even though they were fully conscious and aware during the incident (Bailey & Pico, 2022).

Memories and thoughts have the potential to influence behaviors, triggering a range of emotions such as sadness or anger. Alcohol use disorder may be viewed as a form of repression. It is often associated with the individual's inability to face the reality of their condition, which leads to increased consumption (Moss et al 2015). A characteristic example is when an individual forgets important events or memories, such as stating: 'I do not remember why I started drinking very large amounts; it was the only thing I wanted to do.'

Regression as a primitive defense mechanism in individuals with alcohol use disorder.

Regression: Regression is a psychological defense mechanism in which the individual returns to earlier stages of development or adopts behaviors associated with childhood in response to stress or conflict. Regression may manifest through the adoption of immature or earlier behaviors, such as seeking immediate gratification or avoiding responsibilities, in order to manage emotional issues (Bailey & Pico, 2020).

Regression allows these individuals to avoid facing their problems and to continue drinking as a means of coping. Alcohol may function as a 'refuge' that evokes the safety and simplicity of earlier stages of life (Petric et al 2011). For example, a stressful event may lead an individual to adopt behaviors such as enuresis, chewing pencils, or overeating, even though these behaviors have already been outgrown (Bailey & Pico, 2020). Alcohol use disorder is often associated with traumatic experiences, making regression likely. As individuals characteristically state: 'Life is very hard right now. All I want is to have a good time.'

Projection as a primitive defense mechanism in individuals with alcohol use disorder.

Projection: Projection is a psychological defense mechanism through which the individual attributes their own unwanted feelings, thoughts, or impulses to others (Bailey & Pico, 2020). Projection functions as a means of avoiding recognition of problems related to alcohol consumption. Its use is associated with denial of the problems caused by alcohol use, as well as with shifting responsibility to external factors or other people (Evren et al., 2012). An example is when an individual characteristically states: 'I admit that I drink a little, but have you seen how stressed everyone is in the workplace?'

The Use of Developed Levels of Defense Mechanisms in Alcohol Use Disorder.

These defenses are characterized by the internal boundary between the Ego, the Superego, and the Id. Developed defense mechanisms are psychological strategies that individuals use unconsciously or consciously to manage anxiety, conflicts, and difficult emotions in a way that promotes emotional balance, personal growth, and healthy adaptation to their environment (Bailey & Pico, 2020).

Rationalization as a developed defense mechanism in individuals with alcohol use disorder.

Rationalization: Rationalization is a psychological defense mechanism in which the individual attempts to justify or explain their behaviors, feelings, or thoughts with seemingly logical but often false reasons, in order to avoid internal conflict or anxiety (Bailey & Pico, 2020).

Rationalization is a common defense mechanism used by these individuals. It is expressed as an attempt to justify excessive alcohol consumption, thereby reducing guilt or anxiety associated with this behavior (Kornreich 2002), (Ward & Rothaus 1991). An example is when the individual

tries to give an explanation for their behavior, responding to a friend's question about excessive drinking habits by saying that drinking comes after a stressful day; they characteristically state: 'Drinking helps me relax and cope with life.'

Compensation as a developed defense mechanism in individuals with alcohol use disorder.

Compensation: Compensation is a psychological defense mechanism through which the individual seeks to cover a real or perceived weakness or inadequacy by developing or displaying other abilities or characteristics (Bailey & Pico, 2020).

Compensation may manifest as an attempt to overcompensate in specific areas of life. Individuals often feel inadequate in social or professional situations and use alcohol as a means of enhancing their self-confidence. They often have difficulty at work and resort to drinking at regular intervals in order to relieve feelings of failure. A characteristic example they report is: 'I am not successful, but alcohol makes me feel better' (Koukia 2018).

It is important to emphasize the use of two additional developed defense mechanisms that contribute to maintaining abstinence, namely altruism and humor, which are included among mature defense mechanisms (Koukia 2018).

Altruism as a defense mechanism against alcohol consumption.

Altruism: As a psychological defense mechanism, altruism involves self-sacrifice in order to help others, thereby reducing anxiety and emotional burdens (De et al., 2022a).

The link between alcohol use and altruism as a defense mechanism has not been examined in depth in the literature. Nevertheless, altruism, as a developed defense mechanism, may contribute to reducing anxiety and promoting psychological well-being by offering emotional satisfaction through helping others. This is particularly important for individuals facing difficulties, as participation in altruistic activities can function as a positive coping strategy (Corazzini 2015).

Humor as a defense mechanism against alcohol consumption.

Humor involves finding the funny or ironic aspects of a situation, thereby reducing anxiety and deflecting negative emotional reactions (De et al. 2022). The existing literature linking humor as a defense mechanism with alcohol use disorder is limited. Nevertheless, humor is recognized as a developed defense mechanism that helps manage anxiety and emotional challenges. Strengthening such mechanisms may play an important role in the prevention and treatment of alcohol use disorder. Humor offers a way to release tension through jokes, allowing people to connect with others and break down the barriers that separate them. In addition, it may serve as a means of easing their emotional burden (Canha 2016), (Evren C. et al 2012).

NURSING APPROACHES

Nursing care plays a decisive role in the management of individuals with alcohol use disorder. The interventions carried out can significantly improve therapeutic outcomes for patients. Nurses are responsible for providing emotional support to both patients and their families. An effective way to provide psychosocial support is the creation of support groups and the implementation of motivational interviewing techniques in order to help patients reduce alcohol consumption. This includes participation in open, non-judgmental discussions that explore change and goal setting. Collaboration with other mental health professionals is equally important in ensuring comprehensive patient care (Xu & Liu, 2023) (Yaman & Yilmaz 2020).

A fundamental element of the therapeutic relationship is patient-centered empathy. Ensuring confidentiality is critical for nurses, as it contributes to building trust and encourages open communication about treatment conditions and needs. Education and awareness are essential for nursing approaches that promote mental health and prevention among individuals with alcohol use disorder. In addition, these approaches promote the adoption of healthy lifestyles, such as regular exercise and proper nutrition. Strengthening access to specialized services is also an important step toward improving effective care (Xu & Liu, 2023), (Yaman & Yilmaz 2020).

These approaches significantly promote behavioral change, contributing to long-term recovery. In this context, nurses play a decisive role in providing psychosocial and emotional support. Patient and family education, in collaboration with other health professionals such as occupational therapists and psychologists, constitutes a holistic model of care (Xu & Liu, 2023), (Yaman & Yilmaz 2020).

COGNITIVE-BEHAVIORAL THERAPY

The goal in this area is to reduce excessive emotional reactions by reviewing erroneous and dysfunctional beliefs and behaviors related to alcohol consumption. This approach focuses on identifying and modifying the thoughts and behaviors that promote alcohol use. This therapeutic method can strengthen self-knowledge and awareness, facilitate acceptance of the reduction of primitive defense mechanisms, and explore their origins. In addition, it supports individuals in developing coping skills and managing situations that may lead to relapse (Carroll & Kiluk, 2017).

Once the therapeutic relationship between nurse and patient has been established, the next step in the treatment process is understanding alcohol use disorder. Then, by focusing on goals for change, dysfunctional beliefs can

be challenged and replaced with appropriate behavioral interventions. These include, for example, aversion therapy, stress management, systematic desensitization, neuromuscular relaxation, and the development of communication skills, in order to complete the treatment (Sayette 2017).

Considering primitive defense mechanisms such as denial, repression, and projection, studies have shown that anxiety disorders or depressive symptoms often underlie these mechanisms. Feelings such as anxiety, phobias, compulsions, and sleep disorders are often associated with comorbidity. For individuals presenting these characteristics, further assessment for possible pharmacological treatment is critical (Ray et al 2020). In addition, individuals who use developed defense mechanisms and participate in alternative therapies, such as art therapy and creative workshops, appear to experience positive outcomes, facilitating the development of a constructive vision for a sober life. The focus is on the use of the defense mechanisms of altruism and humor (Iwanicka et al 2017).

MOTIVATIONAL PSYCHOTHERAPY

Motivational counseling is also addressed to individuals who have problems with alcohol consumption and can prove to be an effective method. These individuals usually experience ambivalence, and their inner voice, which already suggests change (known as change talk), is strengthened and developed through a supportive interview, with careful guidance from the counselor (Ceci 2022).

Mental health nurses emphasize the human dimension of motivational interviewing, ensuring that communication is conducted with empathy, respect, consistency, and acceptance. It is crucial always to preserve the patient's autonomy, while advice should be provided only upon request. The conversation should be guiding and supportive rather than authoritarian. The basic principles of motivational interviewing are applied systematically through four processes: engaging, focusing, evoking, and planning (Spaeth 2017).

The likelihood of discussing change increases when discrepancies between life goals and alcohol consumption are highlighted. When an individual expresses resistance to change (through discussions about maintaining abstinence), conflict should not arise; instead, systematic work should be done through reflection, reframing, and emphasis on autonomy. It is also important for the team to receive training for better professional guidance, as well as to be subject to critical reflection through continuous evaluation (Spaeth 2017) (Ceci 2022).

FAMILY COUNSELING

Family therapies can prove particularly beneficial, because support from the family environment is crucial for recovery. These therapies aim to improve communication and relationships within the family, strengthening the individual's support network. Family counseling is an important tool in treatment. Participation of family members in the therapeutic process can increase the effectiveness of treatment and improve family relationships (O'Farrell & Stewart, 2002). In addition, couple therapy is an effective approach that focuses on improving relationships between partners, with the ultimate aim of maintaining abstinence (Song et al., 2023).

Finally, it is worth noting the group of Alcoholics Anonymous, which, through completion of the 12 steps (a method also adopted by other psychological approaches), constitutes both a springboard and a point of reference for these individuals' sense of 'belonging' (Volinik 2021).

GUIDELINE-BASED NURSING APPROACHES

Mental health nurses play a decisive role in recovery from alcohol use disorder by providing care in various therapeutic settings, such as hospitals, rehabilitation centers, specialized treatment units, and community programs. Their responsibilities are diverse and include: (Shand et al. 2003), (Barol et al. 2001), (Yaman & Yilmaz 2020), (Royal College of Nursing 2017).

Assessment and Diagnosis: Nurses are often the first point of contact for those seeking help. They conduct detailed assessments to evaluate the severity of the disorder, identify any coexisting disorders, and assess patients' overall mental and physical health (Shand et al. 2003), (Yaman & Yilmaz 2020), (Royal College of Nursing 2017).

Medication Management: Mental health nurses undertake the administration and monitoring of medications used during the process of physical detoxification, as well as during ongoing treatment. This includes administering medication to address withdrawal symptoms, reduce craving for alcohol, and treat comorbid mental disorders (Marissa 2018), (Yaman & Yilmaz 2020), (Royal College of Nursing 2017).

Psychoeducation and Counseling: They provide education on addiction, the abstinence process, and relapse prevention to patients and their families. In addition, they offer individual or group counseling, supporting individuals in addressing the emotional challenges associated with alcohol use disorder (Marissa et al. 2025), (Yaman & Yilmaz 2020), (Royal College of Nursing 2017).

Care Coordination and Support: They collaborate with other mental health professionals, social workers, and community organizations, ensuring comprehensive patient care. At the same time, they promote individuals' rights and facilitate access to appropriate services (Solari 1990), (Yaman & Yilmaz 2020), (Royal College of Nursing 2017).

Relapse Prevention: This term is related to quaternary prevention. Mental health nurses provide support to individuals, helping them recognize factors that may lead to relapse, focusing on key defense mechanisms. In addition, they promote the development of coping strategies

for creating a prevention plan. Learning behaviors that promote change is critical, because maintaining abstinence from alcohol at this stage is particularly important (Lorman 2013), (Yaman & Yilmaz 2020), (Royal College of Nursing 2017).

Recovery Support: They cultivate a supportive and therapeutic environment that encourages participation in treatment and strengthens the self-confidence of individuals with alcohol use disorder. Recovery and maintenance of abstinence from alcohol are ongoing processes and require continuous support (Marissa et al. 2025), (Yaman & Yilmaz 2020), (Royal College of Nursing 2017).

DISCUSSION

Recognition of defense mechanisms in individuals with alcohol use disorder involves multiple dimensions, as each person is unique and is influenced by biological, psychological, and social factors. A decisive biological factor is heredity, which has been documented through family studies. Findings show that individuals with first-degree relatives who suffer from alcohol use disorder have an increased likelihood of developing the disorder, as well as of earlier initiation of alcohol consumption (Lykouras et al. 2013).

This influence extends to family members, especially children, who, through the theory of imitation, may adopt drinking patterns. Psychological factors shaped by these early experiences combine with personal characteristics and individual behaviors, leading to the development of specific defense mechanisms. At the same time, these mechanisms are also influenced by social factors, such as the work environment and family relationships, which play an important role in shaping and maintaining alcohol consumption behavior (Lykouras et al., 2013).

Individuals with alcohol use disorder often resort to primitive defense mechanisms, such as regression, denial, repression, and projection. These mechanisms, which have developed since childhood, are often maintained into adult life in a maladaptive way. Their use allows individuals to avoid conscious processing of unpleasant situations and to justify self-destructive or dysfunctional behaviors, thereby reinforcing the vicious cycle of addiction (Costa & Brody 2013).

In addition, these specific defense mechanisms may worsen their condition by facilitating avoidance and the rationalized justification of consumption. This may result in neglect of responsibilities, denial of the seriousness of the addiction, and avoidance of accountability, ultimately hindering the recovery process (Costa & Brody 2013).

In contrast, developed defense mechanisms enable individuals to manage anxiety and internal conflicts in a functional and adaptive way. They represent evolved and adaptive behaviors compared with primary defense mechanisms. They prove effective in managing anxiety, traumatic experiences, and internal conflicts. Among the defense mechanisms that act protectively in maintaining abstinence, the focus is on humor and altruism (Iwanicka 2017).

Psychotherapeutic intervention focused on motivating the individual emphasizes action and practical steps toward achieving change. Through a direct approach, such as achieving abstinence, the message is conveyed that change is possible and achievable. Mental health nurses must listen carefully to the individual, focus on the main problem, and avoid unnecessary details. This approach has been shown to be particularly effective in individuals with mild alcohol use disorder (Spaeth 2017) (Ceci 2022).

Cognitive-Behavioral Therapy, Motivational Enhancement Therapy, Family Therapy, and Couples Therapy, combined with the support of Alcoholics Anonymous, constitute an effective therapeutic approach. This multidimensional management can contribute decisively to long-term abstinence and to building a healthier and more creative life. The ultimate goal is to recognize and promote effective developed defense mechanisms, such as altruism and humor, so that they can be applied in practice to achieve abstinence (Carroll & Kiluk 2017) (Volenik 2021).

In summary, the study of defense mechanisms in individuals with alcohol use disorder provides valuable information about the psychological processes associated with the disorder. Through the recognition and management of both primitive and developed defense mechanisms, mental health professionals can design more comprehensive and effective therapeutic approaches. This method focuses not only on the symptoms of the disorder, but also on its deeper psychological causes, facilitating individuals' path toward abstinence.

A comprehensive treatment plan is a transformative process through which the individual modifies erroneous cognitions related to emotional conflicts around alcohol and manages to develop healthy coping behavior.

A central and essential element is the continuous education of mental health nurses specializing in individuals with alcohol use disorder, for the provision of advanced nursing care.

One of the main limitations of this study is its reliance on secondary literature sources rather than the analysis of primary data. Although literature reviews provide important knowledge and contribute to the synthesis of existing knowledge, they may not fully reflect the most recent or detailed developments regarding defense mechanisms in alcohol use disorders. The lack of primary research limits the ability to examine specific cases or to directly record the experiences of individuals dealing with alcohol use disorder and related defense mechanisms. In addition, reliance on published studies may introduce publication bias, as studies with significant results are more likely to be published than those without statistically significant findings.

CONCLUSIONS

To achieve a deeper understanding of defense mechanisms in individuals with alcohol use disorder, future research should focus on the collection and analysis of primary data. Longitudinal studies examining the evolution of defense mechanisms and patterns of alcohol consumption over time could provide valuable insights into the dynamics of addiction and recovery. In addition, qualitative research, through interviews and case studies, may offer a more comprehensive and detailed picture of personal experiences, contributing to understanding the role of defense mechanisms in alcohol use disorder and in the process of maintaining abstinence.

AUTHOR CONTRIBUTIONS

G.S. defined the concept and scope of the review, ensuring that the study was clearly defined and feasible, and participated in writing the manuscript.

P.M. undertook the collection of primary and secondary data, as well as the assessment of their quality and reliability, identifying gaps in the literature and integrating the relevant information through a critical approach.

E.K. undertook editing of the manuscript and carried out the revision in order to ensure clarity, coherence, and accuracy of the synthesized conclusions that help in understanding the topic.

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REVIEW

Indicators of Mental Well-Being and the Meaning of Life in Older Adults

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ABSTRACT

Population ageing emerges as one of the most significant social and public health challenges of the 21st century. The rapid increase in the proportion of older adults is accompanied by a set of multifactorial consequences affecting not only the physical and mental health of individuals in later life, but also their social participation and economic security. In this context, the scientific approach is gradually shifting from the traditional focus on pathology toward a more holistic understanding of well-being, emphasizing active ageing, emotional stability, social support, and the preservation of meaning in life. This conceptual framework is particularly relevant in the European and Greek demographic landscape, where a gradual restructuring of population composition is observed. The increase in the number of very old individuals, combined with declining birth rates, intensifies the demand for care and reveals a range of psychosocial issues that decisively affect the quality of life of older adults. These new realities make it imperative to adapt health and social welfare policies to the conditions of an ageing society. Key areas of this analysis include geriatric depression, social support, economic insecurity, and existential meaning in life. Depression is one of the most common mental disorders in later life, exacerbated by loneliness, chronic illness, and loss of autonomy. Conversely, the existence of stable social relationships and the experience of meaning in everyday life function as protective mechanisms, enhancing psychological resilience and adaptability in the face of the challenges of ageing. The demonstrated association between social, economic, and existential dimensions and the mental health of older adults highlights the need for a multilevel and integrated approach to well-being in later life. Strengthening social participation, ensuring dignified living conditions, and cultivating personal purpose become fundamental factors for the sustainability of a healthy and humane model of ageing.

Keywords: older adults, active ageing, well-being, geriatric depression, social support, economic hardship, meaning in life.

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INTRODUCTION

Ageing is a normal biological process accompanied by multidimensional changes in human physical, mental, and social functioning. As life expectancy increases and the age composition of the population changes, demographic ageing is emerging as one of the most important social and health challenges of our time (Vlachadis et al., 2023). The steady increase in the number of older adults, combined with declining birth rates, is shaping a new demographic and social landscape, with consequences that extend beyond the health sector, affecting the cohesion of social systems and the resilience of welfare institutions.

Older age is often associated with the onset of physical impairments, such as declining vision or hearing, the presence of chronic diseases, and the possibility of disability. At the same time, the gradual weakening of social relationships, isolation, loneliness, and economic insecurity have cumulative effects, undermining the mental health and quality of life of older adults (Papageorgiou et al., 2024).

In this context, geriatric depression is recorded as one of the most common, yet often underestimated, mental disorders in later life. It is a multifactorial condition influenced by physical decline, loss of autonomy, and social withdrawal, leading to feelings of despair, loss of interest in life, fatigue, and, in some cases, suicidal ideation (Zindrou et al., 2015). Depression in later life is directly associated with increased use of health services, impaired daily functioning, and reduced quality of life.

However, the presence of protective factors, such as social support, a sense of meaning in life, the maintenance of functional interpersonal relationships, and active participation in social or creative activities, can strengthen older adults' psychological resilience and offset the adverse consequences of ageing. Cultivating a positive attitude toward life and strengthening inner coherence are associated with improved levels of well-being and reduced mental morbidity. The need to protect older adults from the onset of geriatric mental disorders, and especially depression, emerges as imperative for ensuring active ageing, which functions not only as a shield against morbidity but also as a foundation for promoting quality of life and mental well-being (Costa et al., 2023; Wilkie & Ho, 2024).

DEMOGRAPHIC TRANSITION AND AGE RESTRUCTURING OF THE POPULATION

The gradual shift in the age structure of the population, as recorded in Greece and throughout Europe, constitutes one of the most important developments of recent decades. The continuous increase in the number of older adults, combined with declining birth rates, is shaping a demographic reality that affects all key areas of social organization and public health (Vlachadis et al., 2023). According to the most recent projections, by 2050, 25% of the global population will be over 65 years of age, underscoring the intensity of the phenomenon (Papageorgiou et al., 2024).

Official data from the Hellenic Statistical Authority (ELSTAT, 2024) clearly document this change. The proportion of people aged 65 years and over in Greece increased from 16% in 2001 to 21% in 2020. The rise is even greater among people over 80 years of age, whose share doubled over the same period. At the same time, the proportion of younger age groups is decreasing, particularly among people under 19 years of age, creating a steadily ageing society. In parallel, the population's median age is steadily increasing: from 38 years in 2001, it rose to 44 in 2020, with Greece showing higher values than the European average.

Of particular importance is also the increase in the very old (age ≥80 years), with countries such as Greece and Italy presenting the greatest increase among EU Member States (Manfredi et al., 2019). This subgroup often requires enhanced support structures, which intensifies pressure on the health and welfare system.

At the same time, births are showing a continuous decline. In Greece, from 9.4 births per 1,000 inhabitants in 2001, the rate fell to 7.9 in 2020, intensifying the disproportionate relationship between older and younger people (Frikkee, 2022). This trend leads to an increase in the dependency ratio, with more older adults depending on a smaller number of economically active citizens.

These developments are not merely statistically significant. They redefine the way care, welfare, and public policy must be organized. Population ageing is not simply a biological phenomenon; it is a social challenge (Kanasi et al., 2016). Responding to it requires long-term planning, strengthening support programs for older adults, and actively promoting their participation in social life in order to ensure dignified living and active ageing.

GERIATRIC DEPRESSION

Geriatric depression is one of the most common mental disorders occurring in later life and represents a critical public health problem. Despite its widespread occurrence, a large proportion of cases remains undiagnosed, due both to older adults' own underestimation of symptoms and to frequent misconceptions among health professionals, who often attribute depressive symptoms to the normal ageing process (Argyropoulos, 2016).

Depression in older adults usually manifests with different symptoms compared with younger age groups. Specifically, increased physical fatigue, loss of appetite, sleep disturbances, reduced interest in social activities, and a generalized sense of hopelessness are often observed, which may even extend to suicidal ideation (De La Roca-Chiapas et al., 2023; Sander et al., 2021; Soini et al., 2024). These symptoms may be masked by coexisting physical

illnesses, such as cardiovascular or endocrine diseases, making diagnosis even more difficult (Goodwin, 2006).

The etiological factors of geriatric depression are multifactorial. Decline in physical and cognitive health, chronic diseases, functional limitations, loss of autonomy, loneliness, and isolation are key causes. The absence of social bonds and meaningful support from the family and broader social environment constitutes a significant risk factor, worsening the sense of marginalization often experienced by people in this age group (Babatsikou et al., 2017).

Economic insecurity, which mainly affects older adults with low income or without access to adequate social protection, is directly linked to deterioration in their mental state. Research shows that older adults facing financial difficulties present increased levels of anxiety, sadness, and depressive mood (Assari et al., 2020; Mehta et al., 2016). Particularly vulnerable is the subgroup of older women living alone, who show higher rates of geriatric depression, as they more often experience a lack of social and economic support (Chen et al., 2024).

The impact of geriatric depression is not limited to the psychological sphere. It is accompanied by increased morbidity, more frequent visits to health services, greater use of medication, and increased mortality. At the same time, it significantly reduces quality of life and contributes to social withdrawal and functional dependence, intensifying the pressure on care systems (Paiva et al., 2023).

The need for early identification and intervention is imperative. The promotion of prevention strategies, strengthening of social networks, systematic education of health professionals, and implementation of targeted policies ensuring economic and social support for older adults are essential prerequisites for addressing geriatric depression and improving their mental health.

SOCIAL SUPPORT AND PSYCHOLOGICAL RESILIENCE

Social support is one of the most important protective factors for the mental health of older adults, acting preventively against the emergence of depressive symptoms and broader psychoemotional disorganization (Elsayed et al., 2019).

It is a complex concept that includes both the objective presence of supportive relationships and the individual's subjective sense of being surrounded by care, acceptance, and interest. The presence of stable and meaningful social bonds, whether family, friendship, or community relationships, is associated with higher levels of life satisfaction and improved indicators of psychological well-being.

For older adults in particular, who are often faced with the loss of a spouse or partner, the reduction of social roles, and physical weakening, social support becomes even more decisive. Systematic communication with family members and participation in social and recreational activities contribute to strengthening the sense of belonging, preventing isolation, and reinforcing psychological resilience.

The literature clearly documents the relationship between social support and reduced rates of geriatric depression (Banerjee et al., 2023; Elsayed et al., 2019; Gautam et al., 2024; Gurrapu et al., 2024). Research data from international and Greek studies indicate that older adults who maintain stable relationships with friends, children, and grandchildren or actively participate in social networks show significantly lower levels of emotional burden (Babatsikou et al., 2017; Stylianopoulou et al., 2015). The sense that someone is present and available in times of need has a reassuring effect and strengthens the sense of personal security and dignity.

In addition, social support is not limited to the prevention of depression, but appears to play a role in overall psychological resilience. Older adults surrounded by positive social environments cope more effectively with everyday pressures, develop internal mechanisms of adaptation, and show a greater capacity to manage losses and crises (Mohseni et al., 2019).

Therefore, strengthening social bonds in later life is not merely an emotional need but a public health issue. Designing policies and interventions that facilitate the social integration of older adults, such as creating community networks, strengthening intergenerational ties, and promoting active participation in cultural or volunteer programs, can serve as a key driver for promoting well-being and preventing psychological decline.

ECONOMIC INSECURITY AND PSYCHOLOGICAL VULNERABILITY

The economic situation of older adults is closely linked to their mental health and their ability to maintain dignified living conditions. Economic insecurity, especially when accompanied by lack of support or inadequate state welfare, acts as an aggravating factor that increases levels of anxiety, insecurity, and emotional disorganization. In later life, when opportunities for professional activity are limited and dependence on pensions or benefits is common, a lack of financial stability intensifies the sense of vulnerability.

Research shows that economic hardship affects not only the coverage of basic needs but also has profound psychological consequences. The inability to meet daily requirements, the feeling that one is an economic burden to loved ones, or the reduced ability to participate in social activities is associated with an increased likelihood of depressive symptomatology (Costantini et al., 2024; Mehta et al., 2016). Older people who are not working, do not receive a pension, or have no savings appear to be at greater risk of developing mental disorders, with geriatric depression occurring with particular frequency.

The relationship between economic hardship and mental health is even stronger in cases of living alone, particularly among older women. The absence of financial security, combined with loneliness, creates a complex web of aggravating conditions that leads to psychological deterioration (Chen et al., 2024). In several cases, financial pressure prevents individuals from seeking timely health care, which intensifies problems and leads to greater dependence on the health system at later stages.

Financial autonomy, even at a partial level, appears to strengthen psychological resilience. Older adults who are able to manage their financial resources independently maintain a more positive attitude toward life, strengthen their self-esteem, and show lower levels of depression (Assari et al., 2020).

The recognition of financial security as a key component of mental health in later life indicates the need to develop social protection policies that ensure a minimum guaranteed standard of living. Measures such as strengthening minimum pensions, subsidizing housing, and ensuring access to free health and mental health services are prerequisites not only for material survival but also for the dignity, autonomy, and well-being of older adults.

MEANING IN LIFE AND EXISTENTIAL FULFILMENT

The meaning of life is a fundamental psychological and existential factor that affects quality of life across all life stages, but it acquires particular importance during the transition into and establishment of later life (Greenblatt-Kimron et al., 2022). In this population context, where significant biological, social, and functional changes are observed, the presence or absence of meaning in life appears to be directly related to psychological resilience, well-being, and the capacity for adaptation (Lertsuwan et al., 2025).

The experience of ageing is often accompanied by losses: intimate relationships, roles in the labor market, social status, and functional independence. These changes may trigger identity crises and existential questions, especially when an internal sense of purpose has not been developed. The absence of meaning has been associated with increased levels of depression, reduced psychological well-being, and feelings of futility (Papageorgiou et al., 2024).

Conversely, the presence of meaning in life functions as a psychological stabilizer and a mechanism for strengthening self-perception (Afrashteh et al., 2024). Older adults who continue to experience their lives as useful, creative, or connected to a personal or spiritual purpose show increased resilience in the face of ageing-related challenges. Moreover, they present lower levels of anxiety and depressive symptomatology, as demonstrated by research data both internationally and in the Greek context.

Meaning in life among older adults does not necessarily derive from professional activity or social recognition, as in previous life stages, but is reconstructed through other channels: interpersonal relationships, participation in volunteer or cultural activities, religious faith, creative engagement, and, above all, intergenerational connection (e.g., relationships with grandchildren) constitute strong sources of meaning (Stylianopoulou et al., 2015).

It is noteworthy that the presence of meaning is positively associated with happiness, subjective well-being, and satisfaction with social support, while it also appears to function as a modifying factor in the relationship between depression and economic hardship (as also reflected in the empirical results of the present study). This demonstrates its potential as a protective factor with multiple effects.

Therefore, strengthening meaning in life in later life is not an abstract or purely individual matter, but an issue that involves social, cultural, and institutional parameters. Promoting programs that encourage older adults to participate in actions that reinforce a sense of contribution, supporting spiritual or religious pursuits, and cultivating a positive ageing role are essential strategies for maintaining meaning in life and, consequently, the mental health of older adults.

CONCLUSIONS

Population ageing is not an isolated or temporary phenomenon, but an increasingly intensifying socio-demographic reality, with immediate and long-term consequences for health systems, social welfare, economic policy, and collective cohesion. The growing presence of older adults in the population, combined with declining birth rates, is radically changing the age composition and urgently raises the need to redesign the institutional structures and support mechanisms of the welfare state.

Geriatric depression emerges as one of the most serious and frequent mental disorders in this age group, which, due to the particularity of its clinical presentation and its concurrence with physical illnesses, remains largely undiagnosed or undertreated. Critical risk factors include isolation, loss of autonomy, poor social support, and economic insecurity. Management of these factors cannot be fragmented, but requires a public health strategy and intersectoral cooperation.

A countervailing force against the above threats is the strengthening of social support and the search for meaning in life. The existence of stable social relationships, active participation in communities and activities, and experiential meaning-making of existence prove to be critical variables that enhance psychological resilience, reduce levels of depression, and promote well-being.

The mental health of older adults cannot be examined independently of social inclusion, economic equality, and the ability to participate in meaningful roles. Integrating these factors into the design of ageing policies is not only a social and ethical necessity but also a prerequisite for

shaping a sustainable, humane, and democratic model of social organization.

The creation of an environment that strengthens active ageing, respects personal dignity, encourages social interaction, and ensures accessibility to care and mental health services is the central objective. Only through such a holistic and person-centered approach can substantial improvement in quality of life in later life be achieved.

Authors' Contribution

ET (Eleni Tsiara): Participated in the conceptual development of the topic and in the search for relevant literature. Worked on the writing and final editing of the manuscript.

ID (Ioanna Dimitriadou): Contributed to identifying and collecting the necessary scientific material and to gathering the information. Worked on the organization of the individual thematic sections.

TP (Theodora Plataniti): Undertook the coding and synthesis of the literature, as well as the formulation of the key points of the paper. Actively participated in the writing of the main text.

MS (Maria Saridi): Contributed to the initial design of the structure of the paper and to the selection of the theoretical axes. Also participated in the final formatting of the article.

All authors reviewed, evaluated, and approved the final version of the manuscript submitted for publication.

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