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content

EDITORIAL

EDITORIAL

Health and Society: A brief overview of journal articles summary

Prof. Asoc. Dr. Voltisa GJERGJI

In this issue of Medicus journal we collected articles which are focused on health patterns, health care and economy, as well as health behaviours.

A study from Germany shows models of care for elderly people and the alternative policy strategies such as to stay at home with the help of live-in care.

Another study reports on the attitudes (acceptability, preferences, and needs) of Albanian physiotherapists and the general population toward telerehabilitation. This cross-sectional observational study is conducted among the physiotherapists and the general population asking them about their experiences with tele-rehabilitation in physiotherapy in order to evaluate how recognized and applied is this field in Albania.

There are included two literature reviews in this issue. One literature review is about Alzheimer's disease, one of the most prevalent neurodegenerative illness. It is not yet fully understood how neuronal shrinkage and synaptic loss occur across the cerebral cortex and the interplay of genetic and environmental risk factors. This paper gives an overview of Alzheimer's disease and its pathogenesis. The second literature review aims to understand the kidney-brain interconnection. Cognitive impairment is a significant concern in chronic kidney disease patients, manifesting as a spectrum ranging from mild cognitive deficits to clinically relevant dementia. This literature review explores the clinical significance and the potential mechanisms underlying cognitive impairment in patients with chronic kidney disease. Its approach also highlights ongoing research initiatives, structural and hemodynamic similarities between the kidney and brain.

It is included an epidemiological study which measures the incidence and prevalence of rheumatoid arthritis in the Elbasan district of Albania during the last decade. The study also reports the correlation of different genetic, lifestyle factors (smoking, alcohol consumption, meat and fat consumption) and comorbidities with other chronic diseases such as cardiovascular diseases and diabetes in patients diagnosed with rheumatoid arthritis.

Pneumomediastinum is a rare complication that occurs in patients with Pneumonia caused by COVID-19 and the authors of a case report shows how a timely diagnosis of pneumomediastinum in patients with Covid-19 would prevent the occurrence of life-threatening complications.

Challenges of becoming in need of care and promises of agencies for live-in care in Germany

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Abstract

There are different models of care for elderly people in Germany. Policy strategies provide support, but this is weak for some models, such as live-in care. The latter is an option to stay at home with the help of live-in care. There is no public support for this model, so individuals have to organise it themselves or refer to offers from live-in care agencies that provide carers. Their promises can contribute to the social representation of this model of care. This, in turn, can generate expectations of live-in care. This paper aims to analyse which promises might contribute to the social representation of live-in care and what it might mean for clients to share them. For this purpose, text messages on the websites of 50 agencies are analysed. Agencies empathetically describe the challenges of becoming a care recipient and present live-in care as the best solution. The analysis reveals recurring narratives relating to arrangements, carers and agencies that stabilise different social representations.

Keywords: *Care in Germany, live-in care, narratives, social representations*

Introduction

There are many reasons why people may need long-term care. Individuals and their families then face challenges such as physical or psychological strain, financial or organisational problems. The German government has adopted several measures to help those in need. However, home care in particular remains difficult. Government support is limited and there is a gap in provision. Private organisations, such as agencies that offer to provide helpers, are trying to fill the gap. This paper examines what they promise and what these promises might mean for individuals who rely on them. First, it describes some of the challenges and solutions to provide some relevant background information.

People in need of care, support of care insurance and the chosen care model in Germany

According to the latest data, almost 5 million people in Germany are in need of care (BMG, 2023). Questions arise such as: what kind of state support can they expect, e.g. to cover the costs? What models exist? Which models do clients choose and what can they expect from them?

In 1995, the German government decided to introduce compulsory care insurance to provide security in the event of the need for care.[1] In order to receive financial support from the care insurance, the person has to undergo an assessment procedure. If a person is found to be in need of care, he or she is given a "care level" between 1 and 5, where 1 is for people who need little support and 5 is for people who are very dependent and need intensive care throughout the day. The person in need of care receives financial support from the care insurance scheme according to the level of care certified. It ranges from 125 € (care level 1) to about 2,000 € (highest care level 5) per month.[2] Figure 1 shows some data on people in need of care, their level of care and the chosen care model.

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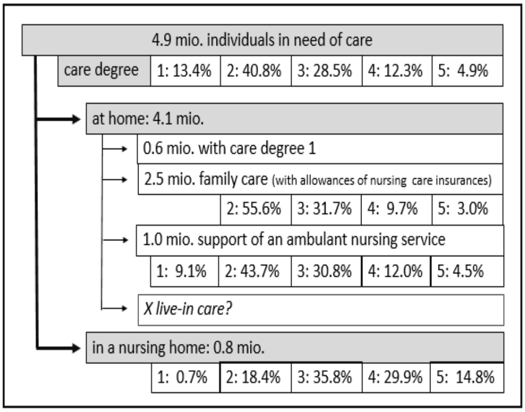
[1] https://www.bundesgesundheitsministerium.de/themen/pflege/online-ratgeber-pflege/die-pflegeversicherung (accessed 10/18/2023).

[2] This description is simplified, as the regulations are more complex and depend e.g. on whether the person in need of care stays at home or in a nursing home.

FIGURE 1: Number of people in need of care and care in Germany



(Data source: Destatis, 2022d)

The data show that most people who need care stay at home. Often, little help is needed at first, provided by family, volunteers or professional helpers. As the need for care increases, the person or their family face the challenge of not only coping psychologically with diminishing abilities and increased need for help, but also organising extensive support. This can lead to a choice between family care, possibly supported by an outpatient care service, live-in care or a nursing home. A brief description of all models is given below to put live-in care in context. Due to the specificities of national health care systems, this description focuses on studies and data collected in Germany.

The family as care providers

Wetzstein and colleagues (2015) call familial care the biggest "care service" in Germany. About 4.7 million individuals are involved as caregivers, two thirds of them are women. According to an older study by Künemund (2002), family caregivers have a comparatively low educational level and receive little social support. They report health problems above average. Strain would be particularly high, if individuals went to work, cared for an elderly relative and children at the same
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Data from the DGB (2018)[3] show that working family members provide an average of 13 hours of care per week, and 71% experience a work-care dilemma. When the care recipient has dementia, a third reduce their working hours or quit their job (Schäufele et al. 2016).

Family caregiving is often associated with economic risks (Ehrlich et al. 2020), risks of career interruptions (Au & Hagen, 2018) or even unemployment (Stroka & Linder, 2016). However, concurrent employment is not generally a source of strain: According to Bidenko and Bohnet-Joschko (2021), family care can affect health, but going to work can also turn out to be a resource - but only up to a certain number of working hours.

Not only economic factors, but also new role perceptions or mobility requirements can limit the resources of family caregivers (Dallinger & Eichler, 2010; Steiner et al., 2019). More complicated or intensive care leads to an increasing need to organise additional help or to find an alternative solution.

Ambulant nursing services as professional care providers

Home care is an important pillar of the health care system in Germany. Around one million people in need of care receive help from one of the approximately 15,400 home care services (Destatis, 2023). However, the care provided by home care agencies is limited in time and may entail costs that are not covered by care insurance. For example, the estimated cost of outpatient care for a person with care level 3 is around €2,400 per month, of which €1,363 is covered by care insurance and €1,037 by the person in need of care.[4]

Nursing homes as professional care providers

There are about 16,100 nursing homes in Germany (Destatis, 2023), about half of which are privately owned (Statista, 2023). In most cases, people have to pay their own contribution to the costs of nursing homes. On average, this amounts to €2,248 per month (BIVA, 2022). For older people in need of care, this could lead to financial problems if they do not have assets or receive financial support from relatives: The average gross pension is around €1,600 per month (Destatis, 2022a). More than a quarter of all pensioners receive less than €1,000 per month, with women in particular receiving very low pensions (Destatis, 2022b). The gross pension is therefore often insufficient to finance a nursing home. This

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[3] DGB: Deutscher Gewerkschaftsbund is an umbrella organisation for eight member unions (https://en.dgb.de/, accessed 07/08/2023).

[4] https://www.muenchener-verein.de/ratgeber/pflege/pflegekosten-und-pflegefinanzierung/ (accessed 04/04/2023).

could also be the case for relatives, as the average net income is €2,135 (Destatis, 2022c), which is also lower than the average contribution. This shows how difficult it can be to finance nursing home care.

In addition, public discussion often refers to the limited resources of nursing homes. One important aspect is the number of staff. Although a minimum standard has been set, a shortage of nursing staff can lead to difficult working conditions. This, in turn, could affect the time available for patients. For example, a calculation published by a recruitment agency concludes that nurses have about 42 minutes per patient per shift. This includes time for basic care, treatment care, documentation and planning, team meetings, communication with relatives, doctor visits or emergencies (Anbosa, no date). If there were a shortage of nurses, the time would be even less. Another aspect of limited resources is savings on care products, accommodation, food and other facilities. For example, a recent study in Saxony shows that the average cost of catering is €5.28 per person per day (Parikom, 2022). This amount is expected to cover all meals and drinks, as well as energy and staff costs. It is therefore likely to result in a loss of quantity and/or quality.

Live-in care

Live-in carers usually come from other European countries and live with the person in need of care for some time. It is an option that is vaguely regulated, for example in terms of quality standards, training, insurance, working hours and income (Leiber & Rossow, 2022).

When families or a person in need of care decide to have live-in care, they have to find carers either on their own or with the help of an agency. If they organise it without an agency, they would have to employ the carer and get the status of an employer with all the bureaucratic obligations. This means a lot of paperwork and is quite expensive due to employer contributions. This is why many opt for undeclared work (Leiber & Rossow, 2022). Another option is to employ a self-employed carer. To avoid problems of bogus self-employment, self-employed carers must be able to prove that they work for several clients and are free from instructions. Otherwise, clients risk high retroactive payments of social security contributions, taxes and penalties (Verbraucherzentrale, 2018). This is also the case for undeclared work. Alternatively, they can hire a so-called "24-hour care agency" to find a carer for them. A German agency acts as an intermediary between the client and an agency in another European country. The client signs a contract with the non-German agency, sometimes with both agencies. The foreign agency sends its carers to Germany. Costs range from 2,200 to 3,200 euros per month.[5]. As there

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[5] https://www.pflegehilfe.org/24-stunden-pflege (accessed 04/10/2023).

is no legally recognised professional status for home care, the financial support from the care insurance is lower than for clients in nursing homes, e.g. in the case of care level 3, the client receives 525 euros for family or home care, but 1,262 euros for care in a professional setting. (The last option, 24-hour care provided by a professional care service, would only be affordable for a very small minority. Based on older data, Satola and Schywalski (2016) estimated the cost at around €24,000 per month).

Most live-in care arrangements are said to be irregular. A study by the Polish Ministry of Labour concluded that 94% of all Polish live-in caregivers work illegally in Germany (Drepper, 2016). Overall, there is no valid data on how many live-in carers work in Germany. Estimates range from 115,000 to 300,000 (Böning & Steffen, 2014) and up to half a million (Stiftung Warentest, 2017; rbb24, 2020).

The German government recognises that live-in care is not controlled and that people in need of care need protection (Deutscher Bundestag, 2016). However, there is still no state support for families to find and organise live-in care. A few years ago, the Public Employment Service (Agentur für Arbeit) offered a service to find caregivers and at least advise families, but it stopped this service in 2019. Instead, it advises families to contact private agencies.

A growing number of older people living at home and weak regulations have made live-in care a very attractive market. In 2009 there were around 60 24-hour care agencies, by 2016 the number had risen to 266. In 2021, the number was 784 (Holsing & Leitner, 2022).

In case of a decision: all but no nursing home?

A 2017 online survey of 1,000 adults in Germany shows that most (85%) believe that nursing homes take the pressure off relatives, but 80% fear this for themselves and only 6% would voluntarily agree to move into one. The main reason for this fear is a perceived shortage of nursing staff, and 48% believed that nursing homes would not provide immediate and competent help. 83% were convinced that they were profit driven. 59% feared they would not be able to afford a care home and almost half feared they would not be able to get out once there. These attitudes reflect some of the problems with care homes described above. According to the survey, about a third would prefer to move to their own flat in a home for the disabled and receive help from an out-patient care service. Another third would prefer to stay at home, also with the help of an outpatient care service. 19% would like to be cared for by a family member and 11% with the help of live-in care (PWC, 2017). Recent survey data from 1,004 people confirms that 89% would prefer to stay at home if they needed care, and only 9% would consider a nursing home. A third said they would prefer assisted suicide to avoid a nursing home (Knops, 2022).

The decision: possibly a result of social representations

We can conclude that becoming a care-dependent person can be associated with different challenges. Factors influencing the choice of a particular care model include motives, family skills and abilities, or contextual variables such as financial aspects or the availability of options. Most people will have only selective information when making choices. The way these options are socially represented may then be particularly relevant.

Social representations are "a structured mental – i.e. cognitive, evaluative and symbolic – content about socially relevant phenomena, which takes the form of images or metaphors, and which is consciously shared with other members of a social group. In the collective view, social representations are seen as a public process of creation, elaboration, diffusion and change of shared knowledge in the everyday discourse of social groups (…)." (Wagner, 1994, p. 200). Reports and public discussion, or in general "the process of communication shapes and transforms our shared representations" (Moscovici, 1993, p. 8). The process of constructing, modifying or integrating social representations can be driven by different anchors: for example, emotional or thematic anchors or anchoring through fundamental antinomies (Höijer, 2011). They can also be made concrete through objectification (Moscovici, 2011). "Everything in a social representation is ordered around a figurative kernel that in a sense 'underlies' all the images, notions or judgements that a group or society has generated over time" (Moscovici, 2011, p. 454).

Social representations of age and care can guide people's decisions. This study focuses on the decision to stay at home with the help of live-in care. Searching Proquest and Scopus for "social representations +care models" or "+live-in care +Germany" did not yield any results. Therefore, to the author's knowledge, there are no empirical studies on social representations of care models. Therefore, an empirical study was conducted that focused only on live-in care. What do agencies promise, how is live-in care socially represented?

Method

In order to understand social representations of live-in care, this study analyses information provided by agencies. This information is collected from their websites, thus collecting 'non-reactive' (Rasmussen, 2008) or 'natural' (Salheiser, 2014) data. The data collection took place in November 2022 and included 50 agencies that were simply selected by a Google search (see Appendix). There were no other selection criteria. All agencies use text and visual messages. Both could influence the way in which becoming a care recipient and residential care are socially represented. However, due to the amount of material, only text messages are analysed.

In order to analyse the text provided on the webpage, the paper uses content analysis according to Mayring (2019). The first step is to summarise the content. For material that offers many lines of interpretation, a second step would be explication. However, this was not considered necessary for this material. The promotional information conveys clear sales messages with little variation in interpretation. The third step is to categorise the content. These categories result from the analysis and are:

- social representations of the initial situation
  - of the elderly
  - of their relatives
  - in nursing homes
- social representations of the solution and promises of/for the
  - perfect type of care
  - perfect caregivers
  - perfect agency
  - clients

These categories also guide the presentation of the results.

Results

Social representations of the initial situation

Situation of the elderly

Several agencies argue that they are well aware of the wishes, concerns and needs of people who become dependent on care (8). They emphasise that all older people would prefer to stay at home (25, 29, 35, 37, 49) because it is their familiar environment (2, 8, 19, 37), their “castle” (38) or “the only place where they can be happy” (1). If they had to move to a nursing home, they would be afraid and would need time to cope (39).

Situation of relatives

Some agencies provide exculpatory arguments as to why family members would not be able to care for their relatives themselves. For example, they argue that family members would not have enough time because of their work or other family responsibilities (38). Relatives would not always be able to cope with high demands (24), but would have limited resources (38). At the same time, they would find it difficult to “put” their relative in a nursing home (25). On the other hand, they want the best for the elderly person and to enable them to stay at home (36).

Situation in nursing homes

Nursing homes are seen as “strange places”, “far away” from the elderly’s families (8), without enough space and staff, which would lead to a lack of care (24) and little time for the elderly (39). Because of the high cost of nursing homes, people would feel burdened (13). Therefore, moving to a nursing home should and could be avoided (18, 25).

Social representations of the suggested solution

Perfect type of care

Choosing residential care provided by an agency would be a “good” or even “excellent” decision (7, 12), hence the choice of the “majority” (13). Instead of ending up on a long waiting list (39) or in an environment determined by the care crisis, older people could expect individual, “privileged” and “all-inclusive” care (7, 8, 9, 13, 16, 17, 18, 19, 24, 26, 29, 33, 34, 35, 37, 46, 49). Residential care would be more flexible than a nursing home (18), the best alternative to it (1, 5, 15, 16, 20, 25, 38). Arrangements are described as legal (1, 4, 5, 7, 14, 15, 17, 18, 24, 25, 31) and affordable (4, 9, 13, 16, 31, 32) and cheaper than a nursing home (2, 7, 14, 18, 24, 30, 35, 37, 41). Agencies promise the best value for money (17, 19, 25). At the same time, clients do not have to worry about hidden costs (19) or labour exploitation because the arrangement is based on fair conditions (1, 3, 7, 9, 15, 16, 17, 44).

Perfect caregivers

Most agencies promise perfect carers. They are described as adaptable and very flexible (28, 40). They are also described as open-minded (28), considerate (2, 7, 9, 18, 24, 31, 40), respectful (40), trustworthy (9, 16, 26, 50), reliable (1, 2, 3, 5, 15, 21, 31, 37) and hardworking (24, 42). They are described as friendly (2, 10, 19, 26), humorous (40), sensitive (5, 8, 9, 11, 17, 23, 28, 33, 42, 47, 50), loving and caring (7, 11, 13, 15, 16, 17, 19, 21, 23, 24, 26, 28, 30, 33, 35, 37, 38, 40, 41, 46, 47, 49). Some agencies speak of “angles” (13, 47).

Regarding their professional competences, some agencies refer to “nurses” (3, 5, 39), others to qualifications (1, 23, 35), professionalism (8, 10, 11, 13, 16, 17), competences (8, 10, 12, 17, 20, 23, 27, 31, 35, 50), training (5) or simply experience (1, 5, 7, 10, 11, 13, 17, 18, 20, 23, 24, 31, 35, 37, 40, 47).

Some agencies promise to find a carer for everyone (10). They rule out problems even for people with dementia (48) and claim that any difficult care can be handled by experienced carers (18). Agencies would only place carers they would send to their own parents (23).

Sporadically, they promote values such as the Catholic faith, traditional values of welfare and charity (40), or the positive cultural background of carers, e.g. from Poland (12, 17, 18, 24). Some agencies conclude that Polish carers would guarantee the care of the person in need of care (18). Furthermore, caring for the elderly and living in multi-generational households would be normal for Eastern European countries (28, 32, 48).

In addition to personality traits, professional competences and values, agencies also refer to the motives and motivation of care workers. They want to work in Germany (31) and are generally described as highly motivated (31, 47), committed (18, 28, 40), enthusiastic and passionate (23, 24, 36). Few agencies even promise that their carers would be dedicated and committed (5, 8, 24). Their carers would care as family members would (20, 32). Clients could expect 'genuine emotional attachment' (28), friendship (16) or even family closeness (21, 33).

In order to validate the competence, integrity and health of carers, some agencies stated that they were 'tested' or checked (1, 2, 9, 15, 23, 27, 44). Strict recruitment criteria and standards (9, 16) and ongoing quality controls would ensure high quality care (3, 9, 12, 17, 44).

Perfect agency

Agencies also describe themselves as passionate: “We care with passion” (16), “We love what we do” (30), “Our service is our vocation” (27), “Our heart's desire is to find you loving and qualified care” (35) or “We have a heart for the elderly” (2). They are “experts” and clients can choose them “without worries” (6). They describe themselves as a powerful ally (29) or a trustworthy partner (27) and promise a simple solution with little paperwork (16). Some agencies offer “guarantees” such as satisfaction (15), “maximum security” and “some quality of life” (17).

To demonstrate their expertise, agencies quote figures such as experience of 50,000 placements (7), more than 3,000 carers (15) or years of experience (13, 27, 31). Others refer to “many” families (31), all of whom would be satisfied (13).

In an attempt to promote their own merits, some agencies point to bad agencies, characterised by empty promises (21), lack of transparency, hidden costs and confusing and complicated regulations/rules (4). While clients may have had bad experiences with other agencies or carers (21), these agencies claim to be better (27).

Perfect solution for the elderly in need of care

Perfect caregivers ensure perfect care because care is centred on the client's wishes (1, 5, 7, 8, 10, 24, 42). Many agencies advertise help 24 hours a day (13, 21, 24, 25, 26, 29, 31, 35, 38, 41, 47) or "almost all day" (7). Spontaneous help is 'always' possible (44), including at night (1, 29, 47): "The carer is always present and provides competent care - that is possible!" (13).

Carers would do the housework (38), prepare healthy food (18), accompany the person to the doctor (38, 47), spend time with the person (18, 24, 29), talk and listen to them (48) and provide amusing entertainment (38, 47).

Above all, emotional closeness would enable clients to live in family-like structures without being a 'burden' on their own family members (24, 35, 44). In turn, the familiar environment allows them to remain independent, autonomous and self-determined (1, 4, 7, 13, 18, 19, 21, 22, 29, 35, 45). This arrangement maintains social relationships (19, 45) and routines (19, 29). Because carers provide protection, clients feel safe (1, 5, 11, 13, 18, 23, 30, 42). "The carer makes everything possible and a lot of things easier" (24) and enables people in need of care to cope successfully with everyday life (24, 47) or even to live a "worry-free" life (28). As a result, agencies promise positive emotions (11, 14, 23, 29, 44), improved self-esteem and general wellbeing (22, 23, 24). Residential care would prevent loneliness and depression (47). Overall, dignity (1, 18, 28, 37, 41, 45) and quality of life (7, 19, 23, 44, 45, 47) are maintained or improved. One agency goes so far as to promise that 'the person in need of care will live longer' (5).

Perfect for relatives

Relatives would also benefit from live-in care, as it would be a "relief" for them (5, 16, 18, 19, 20, 21). It allows them to fulfil family or professional obligations (16, 18, 19) and to spend time with the person in need of care according to the person's wishes instead of caring duties (20).

Most agencies promise perfect care in every respect, only a few point out some limitations.

Mentioned restrictions

While some agencies refer to 'nurses' and professional care, few make it clear that carers are neither trained nor certified (32, but experienced, 13, 49). They are therefore not allowed to provide medical services (5, 32, 48).

Contrary to the term '24-hour care', some agencies emphasise that carers would not work 24 hours a day because they need breaks, time off and night rest (2, 7, 22, 25, 28, 29, 32, 45, 49). Some agencies add that carers would still be on call (44, 47, 48). Often such comments about restrictions are placed under a rather long description of promises about live-in care. Sometimes they are contradictory. One agency talks about 24-hour care, but later specifies that 24-hour carers work 5-6 hours a day (8). Another agency states that live-in care would be available 24 hours a day, later reduces it to 40-48 hours a week and adds that if more time is needed, each hour would be charged at €12 (29).

Discussion

Anchors stabilize social representations of live-in care

Social representations of live-in care use different anchors - mainly thematic and emotional anchors or anchors via antinomies, referring to fears and desires - as well as objectification, referring to stereotypes. In some cases these anchors are interlinked.

For example, the initial situation described for people in need of care reflects the public debate on care for the elderly or could be based on pre-existing attitudes or experiences. Anchors are reduced abilities, challenges in balancing work and care, and limited resources, all of which lead to a difficult situation. Agencies express sympathy for such difficult situations in families and present live-in care as an ideal solution to cope with them.

Commentaries on nursing homes often use emotional anchoring, especially the emotion of fear. If, at the same time, the media report on deficits in nursing homes, as is often the case in Germany (e.g. Schramm, 2022, Reister, 2021, Fuchs & Köpf, 2022), the negative social representation of nursing homes becomes frightening - and a powerful anchor. This, in turn, could make live-in care more attractive and create high expectations. By presenting residential care as the best solution, antinomies are based on a contrast between nursing homes and residential care.

Agencies seek to persuade through the representativeness heuristic by pretending that most people would choose residential care - which contradicts the empirical evidence presented above. Claims about value for money and quality are also sweeping statements. The main promise is that live-in arrangements provide perfect care and put clients in a privileged position.

Comments on carers are likely to address the obvious desire to be cared for by someone with high intrinsic motivation and empathy, as in family structures, but also with professional competence. Furthermore, they do not need to fear negative experiences such as health problems of the carer, inadequate care or even criminal offences. In this respect, marketing arguments capitalise on anchors via antinomies, which may refer to media reports on deviant or criminal behaviour of caregivers (e.g. Vaassen, 2018, Rieger & Weißbier, 2017) or internet forums.[6] While some agencies subtly acknowledge that there might be problems in other cases, their own carers would only have positive attributes. Not only strong emotional anchoring could be used, but also objectification, e.g. through the symbol of angles. Again, the representativeness heuristic is used to persuade, in this case the stereotype of the perfect carer, e.g. from Poland. However, a setting based on the involvement of lay people, who are likely to act not only from intrinsic motives but also from extrinsic motives, could be a source of disappointment.

Similar to the social representations described above, agencies present themselves as intrinsically motivated with attributes of professions (e.g. vocation, support in non-economic settings), thus disguising their economic interests. While other agencies may be ‘black sheep’ that only create new problems, they are trustworthy and offer guarantees. Again, social representations based on anchoring through antinomies. Furthermore, marketing arguments include guarantees of limited reliability, as they are neither standardised nor controlled.

Benefits for clients may refer to diminishing abilities and skills, suggesting that live-in care can contribute to an almost normal life - or even promise a longer life. Because of emotional anchors that associate ‘normal’ life with all its positive associations, even unrealistic promises can be effective.

Recurring narratives produce unrealistic promises

The results revealed recurring narratives that were used to establish a particular narrative about residential care. If clients believed them, they could be disappointed when promises turned out differently in their cases.

For example, agencies often claim that the arrangements were legal. Steiner and colleagues (2019) call this the “legality narrative”. However, clients need precise legal knowledge in order to assess whether the contract they sign with agencies abroad complies with German law. In the event of a conflict, clients could be charged. If the client has only signed a contract with an agency abroad, a German agency may appear to be just an intermediary with no legal involvement. The client would then have to deal with legal conflicts. This could make it easier for agencies to make big promises.

There have already been cases that have gone to court. For example, a Bulgarian carer went to court to claim that she should be paid for 24 hours a day because she stayed with the elderly person all day. Her claim was directed at the agencies involved and the client. In the end, the court awarded her €38,709 for seven months,

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[6] E.g. https://forum.jusline.at/viewtopic.php?t=9533 (accessed 04/07/2023).

emphasising that on-call duty should also be paid at the German minimum wage.[7] This example shows that despite a narrative of legality, legal problems can arise that can cause immense problems and additional costs. If live-in care were to be interpreted as a 24-hour on-call service, with carers living in the home of the person in need of care, this model of care would also become unaffordable for most families. Roughly speaking, it would cost around 7,000 euros per month for a six-day week or 5,760 euros for a five-day week.

This leads to the next *narrative of value for money*. While agencies advertise the best prices and cheap solutions compared to nursing homes, this may turn out to be false, either because of hidden costs or reduced financial support.

Above all, agencies promote a *narrative of professionalism*. But carers employed by 24-hour agencies don't have to be nurses. They do not have the training of professional staff, nor can they rely on the professional support of home care services or nursing homes. This in turn can cause problems for carers and clients. Carers may experience stress and feel overwhelmed. According to Lutz (2009) and Karakayali (2010), carers sometimes provide care that was officially excluded from the contract. Interviewees in the study by Hopfgartner and colleagues (2022) report that when problems arise, agencies present caregivers with a choice between staying and continuing to work or being fired. In general, such overburdening and lack of control can lead to unprofessional behaviour, in some cases even to care errors or violence (**Gräßel & Behrndt, 2016;** Tesch-Römer, 2018).[8] Both have a negative effect on clients.

Agencies repeatedly present a *narrative of intrinsic motivation and dedication*. The resulting narratives of caregivers neglect that other motives may be dominant, for example, to do a job for a short period of time that does not require training, but can earn a lot of money quickly (compared to the average income in their country). For example, interviews conducted in Austria confirm that Romanian carers have mainly financial motives (Hopfgartner et al., 20-22). For example, the net income in Romania in 2022 was about 9,000 Euros per year.[9]

Against this background, live-in care work could become attractive in Germany. At the same time, respondents complain that they have to pay high fees to the agency if they want to move to another client. The study by Phan-Warnke and Freitag (2021) confirms that contracts often contain clauses and penalties. This can result in a carer staying in one place without really wanting to. This would also undermine the *narrative of emotional closeness*.

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[7] Urt. v. 05.09.2022, Az. 21 Sa 1900/19, https://gerichtsentscheidungen.brandenburg.de/gerichtsentscheidung/638 (accessed 04/12/2023).

[8] At the same time, caregivers can also become victims of violence (Hopfgartner et al., 2022).

[9] https://de.statista.com/statistik/daten/studie/1198914/umfrage/durchschnittliches-nettoeinkommen-von-singles-und-familien-in-rumaenien-im-vergleich/ (accessed 08/10/2023).

Finally, the *all-inclusive care narrative* is also likely to fail. The study by Hopfgartner and colleagues (2022) provides examples of carers who did not take on domestic tasks. Although some studies identify exploitation (Hopfgartner et al., 2022; Phan-Warnke & Freitag, 2021), this is indicative of autonomy and a position of power. A study of Polish carers confirms that 80% feel free to choose where they work and would not work more than six hours a day on average (Petermann et al., 2017).

All in all, various narratives imply exaggerated promises that influence the construction of social representations. Agencies serve the desire for dignified ageing by promising an easy, legal, cheap and reliable solution with the best care provided by experienced, empathic and intrinsically motivated carers. Some of these promises are unrealistic and unprofessional. In addition, such statements devalue professional care to some extent and reduce care homes to an institution to be avoided.

Limitations and conclusion

The study presented here has several limitations. It sheds light on only a small facet of social reality, as it is based on the description and interpretation of web page text from 50 agencies. However, the results show almost identical representations of the challenges of becoming dependent on care, of agencies, live-in care and carers. In this respect, it can be assumed that we are close to theoretical saturation.

It remains to be seen whether clients share these perceptions of domiciliary care, or how perceptions might change as a result of experience. Reviews on the internet sometimes show only excellent ratings. Of course, it is possible that all clients are completely satisfied - but this seems highly unrealistic. It should be borne in mind that internet reviews may be manipulated for marketing reasons (Hu et al., 2021), in which case such reviews do not represent social reality.

Other sources give evidence for disappointment as described above, e.g. a forum on "experiences with 24 hours live-in care":[10] Clients report that carers often do not speak enough German, making care extremely difficult or impossible. This may not be an isolated case. It could be part of an agency's strategy if they were particularly interested in sending carers abroad without (sufficient) language skills, knowing that clients would ask for a replacement in order to charge the commission again (Hopfgartner et al., 2022). Other clients report caregivers who refuse to do housework or who ask for more money every time they are asked to

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[10] https://pflegeheimportal.de/blog/erfahrungen-mit-einer-24-stunden-pflege-aus-osteuropa.html (accessed 03/31/2023).

do something. They would not prepare healthy food, but only reheat ready meals. These observations fit in with the limited willingness to do work other than 'caring' as described above. Some clients report carers who were unreliable or unable to cope with caring for a person with dementia. Other clients report criminal behaviour, such as carers stealing the elderly person's belongings or committing fraud. Other carers had alcohol or mental health problems themselves and were unable to care for the elderly person. Agencies would not screen carers to ensure a good fit, but would send anyone, explaining that clients had no choice anyway because there were simply not enough staff. Some clients report that their relative eventually moved into a nursing home because of the unsatisfactory support provided by live-in care. They experienced that the care in professional nursing homes was much better. All these examples are individual cases, but they highlight possible experiences that contradict the promises made by agencies.

Live-in care is an important option for home care because it fills a gap in the provision of care in Germany. There is no doubt that agencies and carers can do an excellent, professional and high quality job, so this solution is beneficial for carers, clients and relatives. However, live-in care is a very attractive market due to the combination of the growing number of elderly people in need of care, limited resources for family care and the lack of standards and controls for agencies and caregivers. The lack of regulation allows agencies to make many promises or guarantees without fear of sanctions. Typical market mechanisms imply that providers want to achieve a goal with the least possible resources, or make the highest possible profit with the given resources. The problem, of course, is that the object subjected to economic principles is a human being, either the elderly person or the carer.

The recent German government stated after its election that it would address this issue (SPD et al., 2021). So far, however, nothing has changed with regard to residential care. There may be several reasons for this. As long as a person in need of care stays at home, care seems to be a private, family - and mainly female - responsibility. In addition, home care is cheap for the state as families pay for most of it themselves with little public support. Finally, older people do not have a strong lobby in Germany. Nevertheless, efforts are needed to take live-in care out of the grey market and to better protect older people and live-in carers.

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Appendix: Table 1 – included agencies

Aurea Pflegevermittlung	https://aurea-pflegevermittlung.de/ (accessed 11/23/22)
Bayernpflege	https://www.bayernpflege.de/ (accessed 11/23/22)
Brinkmann	https://www.brinkmann-pflegevermittlung.de/(accessed 11/23/22)
CPS24, Care Pro Senior 24	https://www.cps24.info/, (accessed 11/23/22)
Cura Optima	https://cura-optima.de/24-stunden-pflege/(accessed 11/23/22)
Deutsche Altenpflege	https://deutschealtenpflege.de (accessed 11/23/22)
Deutsche Seniorenbetreuung	https://www.deutsche-seniorenbetreuung.de (accessed 11/23/22)
Dianna 24	https://dianna24.de/ (accessed 11/23/22)
Enni	https://www.ennie.de (accessed 11/23/22)
Evita Care	https://evitacare24.de (accessed 11/23/22)
Fischer Pflegevermittlung	https://www.fischer-pflegevermittlung.de/ (accessed 11/27/22)
Gastamo	https://gastamopflege24.de/(accessed 11/27/22)
Hausengel	https://www.hausengel.de/24-stunden-pflege-zu-hause/ (accessed 11/26/22)
Ihre 24 Std. Pflege	https://www.ihre-24h-pflege.com/ (accessed 11/26/22)
Jacura	https://jacura.de/ (accessed 11/26/22)
Jan Schweitzer Pflege 24	https://jan-schweitzer-pflege24.de/ (accessed 11/26/22)
Jaso24 Pflege Ja zum Sozialen	https://jaso24-pflege.de/ (accessed 11/26/22)
KWH Seniorenbetreuung Stuttgart	https://meine-pflege-zu-hause.de/ (accessed 11/26/22)
Lebenshilfe24	https://www.lebenshilfe24.de/ (accessed 11/26/22)
Linara	https://www.linara.de (accessed 11/26/22)
Marta	https://info.marta.de/24-stunden-pflege-zuhause/ (accessed 11/27/22)
Mecasa	https://www.mecasa.de/24-stunden-pflege/ (accessed 11/26/22)
Medi experts	https://www.pflege24-mit-herz.de/ (accessed 11/26/22)
Nonstopppflege	https://nonstoppflege.de/ (accessed 11/26/22)
Pflege 24	https://www.pol-pflege24.de/ (accessed 11/26/22)
Pflege 24	http://www.pflege24.org/ (accessed 11/26/22)
Pflege 24 Expert	https://pflege24.expert/ (accessed 11/26/22)
Pflege Agentur Stefanidis	https://pflege-fuer-daheim.de/ (accessed 11/27/22)
Pflege zu Hause Küffel	https://www.pflegezuhause.info/24-stunden-pflege/ (accessed 11/27/22)
Pflege24 NRW	https://www.pflege24nrw.de/ (accessed 11/26/22)
Pflegeagentur 24	https://pflegeagentur24.de/ (accessed 11/26/22)
Pflegehelden	https://www.pflegehelden.de (accessed 11/26/22)
Pflegehilfe für Senioren	https://www.pflegehilfe-senioren.de (accessed 11/27/22)
Pflegekräfteservice	https://pflegekraefte-service.de/24h-pflege/ (accessed 11/27/22)
PR Care 24	https://pr-care24.de/de/ (accessed 11/27/22)

Primecare	https://primecare.de/ (accessed 11/27/22)
Procuracare	https://www.procuracare.de/ (accessed 11/27/22)
Schwabenpflege	https://www.schwabenpflege24.de/ (accessed 11/27/22)
Senioba	https://senioba.de (accessed 11/27/22)
Seniocare 24	https://www.seniocare24.de/ (accessed 11/27/22)
Sofiapflege	https://www.sofiapflege.de/ (accessed 11/23/22)
Sorgenfrei	https://www.sorgenfrei-betreut.de/24-stunden-pflege.html (accessed 11/27/22)
Stahlberger Pflege 24	https://www.stahlberger-pflege24.de/ (accessed 11/27/22)
Sunacare	https://www.sunacare.de (accessed 11/27/22)
Tollbetreuung	https://www.toll-betreuung.de/ (accessed 11/27/22)
Top Pflege	https://top-pflege24.com/ (accessed 11/27/22)
Ulmer Pflege 24	https://www.ulmer-pflege24.de/ (accessed 11/27/22)
Verbund Pflegeberatung	https://verbund-pflege-beratung.de (accessed 11/27/22)
Vilena	https://vilena.de/24-stunden-pflege-berlin (accessed 11/27/22)
Vitalpflege	https://vital-24-pflege.de/ (accessed 11/27/22)

Adopting Telerehabilitation in Albania: Evaluating Acceptance, Preferences, and Impediments Among Physiotherapists and the Public

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Abstract

Background: *COVID introduced a new approach to healthcare services. The pandemic showed that the need to rely on online services is very significant. Telerehabilitation, as the delivery of rehabilitation services via information and communication technologies, is a well-known concept for developed countries but not for Albania.*

Objective: *To investigate acceptability, preferences, and needs in telerehabilitation by Albanian physical therapists and the general population.*

Methods: *A cross-sectional observational study was conducted among physiotherapists and general population related to tele-rehabilitation in physiotherapy to verify how recognized and applied this field is today in Tirana, Albania*

Results: *The study involved 57 professionals, mostly aged 25-34, with 43 participants working in the private sector. The focus was on musculoskeletal and orthopedic issues, with 18 participants in each category. Opinions on tele-rehabilitation were divided, with 42% of physiotherapists in favor and another 42% remaining neutral. Most physiotherapists had no prior tele-rehabilitation experience, but about one-third found technology integration beneficial.*

Health information and education were widely supported, with 86% of participants in favor. Self-management strategies were endorsed by 77%. Among 173 non-physiotherapists, the vast majority were females (94%) and mostly aged 25-34 (nearly half). About two-thirds had never used physiotherapy services. Attitudes towards tele-rehabilitation costs were uncertain for almost half of the participants. However, 58% recognized the potential of digital technology, with video conferencing seen as helpful by 52% and apps by 18%. Most participants preferred exercise prescriptions, self-management, and health information.

Conclusion: *The conclusion points towards the need for further education and infrastructural enhancements to fully realize telerehabilitation's capabilities in improving healthcare accessibility in Albania.*

Keywords: *Digital physical therapy, Perception, Rehabilitation, Telehealth*

Introduction

Telerehabilitation is the practice of delivering rehabilitation services remotely through telecommunications networks and the internet. This innovative healthcare approach utilizes technologies such as video conferencing, wearable sensors, and mobile health applications to provide therapeutic interventions, assessments, and consultations from a distance (Gupta, 2023).

Particularly beneficial for patients in remote locations or those with mobility issues, telerehabilitation breaks down geographical barriers, making essential rehabilitation services accessible to those who might otherwise face significant challenges in receiving care (Alexander, 2022) .

The adaptation of telerehabilitation during the COVID-19 pandemic further emphasized its critical role in maintaining continuity of care while adhering to social distancing measures, showcasing its potential to transform traditional rehabilitation practices (Boldrini P, 2020).

Following its definition and initial introduction, it is essential to delve into the strategic importance of telerehabilitation, particularly as highlighted by World Physiotherapy (Physiotherapy, 2019).

This organization's position statement not only recognized telerehabilitation as a transformative approach in healthcare but also actively encouraged physiotherapists worldwide to adopt this technology-enhanced method of care delivery. The urgency and relevance of telerehabilitation became even more pronounced during the COVID-19 pandemic. As countries imposed lockdowns and social distancing became the norm, telerehabilitation emerged as a crucial solution, enabling the continuation of essential rehabilitation services without physical contact. This period underscored telerehabilitation's capacity to adapt to global health crises, offering a viable and effective alternative to traditional face-to-face therapy sessions, thus ensuring uninterrupted care for patients across various demographics (Buabbas AJ, 2022), (Boldrini P B. A., 2020).

Following the discussion of its strategic importance, it's crucial to explore the technological evolution of telerehabilitation, which has transitioned from primarily synchronous interactions to include asynchronous methods as well. Initially, telerehabilitation relied heavily on real-time communications, such as video calls, where the therapist and patient interacted live. This method mirrored traditional in-person sessions, providing immediate feedback and support.

However, as the field has matured, there has been a significant shift towards incorporating asynchronous techniques, where information, therapeutic exercises, and feedback are provided via platforms that do not require both parties to be present at the same time. This development was driven by the need to overcome various operational challenges, such as scheduling conflicts, varying time zones between patient and provider, and the limited availability of therapists (Parmato B, 2009) discusses these advancements, highlighting how technological innovations in telerehabilitation have been crafted to replicate the nuances of face-to-face interactions within a digital framework.

This evolution has broadened the accessibility of services, allowing patients to access therapeutic guidance and perform prescribed activities at their convenience. Additionally, it has enabled the storage and subsequent analysis of patient data, enhancing personalized treatment plans and ongoing monitoring without the continuous presence of a healthcare provider. This shift not only meets the operational needs of a growing patient base but also addresses the challenges posed by clinician shortages and the rising demand for rehabilitation services globally.

The efficacy of telerehabilitation is supported by robust research, demonstrating its effectiveness and cost-efficiency across a variety of conditions. For instance, studies on motor impairments have shown that telerehabilitation can provide outcomes that are equal to or even better than traditional face-to-face therapy (Nelson M, 2020). A landmark study by (Vellata C, 2021) highlighted that telerehabilitation significantly improved patient recovery rates and reduced costs associated with motor impairment therapies.

In the realm of chronic disease management, the "TeleCare North" project in Denmark serves as a compelling example of how telerehabilitation can transform care delivery. This cluster-randomized trial investigated the cost-effectiveness of telehealthcare for patients with chronic obstructive pulmonary disease (COPD). According to (Witt Udsen, 2017) the study found that telehealthcare dramatically reduced hospital visits and enhanced the overall management of COPD, improving patient quality of life while also cutting down the costs associated with traditional care methods. These findings suggest that telehealthcare systems are not only viable but also economically sustainable options for managing chronic conditions.

While telerehabilitation has demonstrated significant benefits, its implementation is not without challenges. These challenges can be categorized into technological barriers, user acceptance issues, and infrastructural deficiencies, each contributing to the complexity of deploying telerehabilitation services effectively. In a 2019 report by the Albanian Institute of Statistics (INSTAT), it was documented that internet access in Albania has seen a noticeable improvement, with 82.2% of households having internet access, up from 80.7% in the previous year. Notably, 88.9% of households reported access to mobile broadband, facilitating the use of internet services on mobile devices. Among individuals aged 16-74, 68.6% used the internet, with a significant 87.1% doing so daily. Furthermore, a high percentage (92.3%) of the same age group utilized internet-based communication tools such as Skype, Viber, and WhatsApp in the last three months of the year. This widespread adoption of internet and communication technologies underscores the potential for implementing digital health services such as telerehabilitation in Albania, which could significantly benefit from such technological engagement (Daci, 2020) .

Acceptance of telerehabilitation by both patients and healthcare providers is crucial for its success. However, skepticism exists, particularly among those accustomed to traditional face-to-face interactions (Muñoz-Tomás, 2023), (Ramachandran, 2022). Concerns about the quality of care, privacy of data, and the impersonal nature of remote consultations can deter individuals from adopting this model. A systematic review by (Sulaj, 2022) collected data from various articles and research papers over the last five years, confirming that telerehabilitation is both a feasible and acceptable method for treating diverse conditions like osteoarthritis, low back pain, and cardiac and pulmonary issues.

Developing countries might prioritize other more immediate healthcare needs or infrastructure developments over the establishment of telehealth policies. Limited financial and human resources mean that telehealth may not be seen as an immediate priority in the face of other pressing healthcare challenges.

Telerehabilitation's global and demographic impact is significant, especially as it addresses the unique challenges faced by rural areas, aging populations, and specific national concerns.

In rural regions, the scarcity of healthcare providers and facilities often means that residents receive less frequent and lower quality care. Telerehabilitation can bridge this gap by providing remote access to specialized care, thus overcoming geographical barriers.

As the global population ages, the demand for healthcare, particularly for chronic disease management and rehabilitation services, increases. Telerehabilitation offers a way to meet these needs without requiring elderly patients to travel, which can be both difficult and risky, especially for those with limited mobility. For example, in China, the surge in rehabilitation needs among the elderly by over 70% in the last three decades highlights the growing demand for accessible care services (Guo, 2022).

Telerehabilitation can provide continuous, personalized care to this demographic, helping them maintain independence and manage health conditions effectively from home.

Each country faces unique challenges that can be addressed through tailored telerehabilitation strategies. For instance, in Albania, projections indicate a significant increase in the elderly population needing care by 2050 (ILO, 2024) which will likely strain existing healthcare resources. Telerehabilitation can alleviate some of this pressure by offering an alternative means of delivering health services. Similarly, in low and middle-income countries, where the World Health Organization has flagged unmet rehabilitation needs as a significant health issue (Gimigliano, 2017), telerehabilitation could serve as a crucial strategy to enhance the healthcare system's capacity and outreach.

Addressing these demographic-specific challenges through telerehabilitation not only has the potential to improve individual health outcomes but also impacts broader health systems by reducing hospital stays and the associated healthcare costs. Effective implementation, however, requires consideration of local contexts, including cultural acceptance, regulation, and the existing healthcare infrastructure, to ensure that the interventions are appropriate and effective.

The necessity for telerehabilitation arises from its ability to provide equitable health service delivery across diverse populations and geographical locations. By customizing its application to meet the specific needs of each demographic, telerehabilitation stands as a pivotal solution in the global strategy to improve healthcare accessibility and efficiency (Borges, 2021), (Stephenson, 2022) .

Objectives

1. **Evaluate Acceptance**: Assess the current level of acceptance of telerehabilitation among physiotherapists and the general public in Albania.
2. **Determine Preferences**: Identify the specific technological preferences for telerehabilitation among both physiotherapists and non-physiotherapist participants.
3. **Identify Needs**: Investigate the needs for resources, training, and infrastructure required to implement effective telerehabilitation services.
4. **Analyze Barriers and Facilitators**: Explore the barriers to and facilitators for the adoption of telerehabilitation, focusing on aspects such as cost concerns and technological advantages.

Methods

Participant Selection and Data Collection: We conducted a cross-sectional observational study among physiotherapists and the general population in Tirana, Albania, utilizing two tailored online questionnaires. Physiotherapists were reached via the National Association of Physiotherapists, and the general population through a social media platform with a predominantly female audience. This approach unintentionally skewed the gender balance of respondents, predominantly attracting female participants, which is acknowledged as a limitation of the study.

Questionnaire Design, Ethical Considerations, and Limitations: The questionnaires, derived from the validated work of (Fernandes LG, 2022) gauged perceptions of telerehabilitation's acceptability, preferences, and needs. Ethical approval was obtained, and participants consented to anonymity, ensuring the ethical integrity of data collection. However, the study faced limitations such as the potential bias introduced by the predominant use of a social media platform favored by females, and the challenges of generalizing findings across a more diverse population.

Data Analysis and Presentation: Data were analyzed descriptively to summarize key findings and inferentially to explore relationships between variables. The results were visualized through graphs to illustrate the distribution and trends clearly, facilitating an easier interpretation of how perceptions and preferences are aligned with the current state of telerehabilitation in Albania.

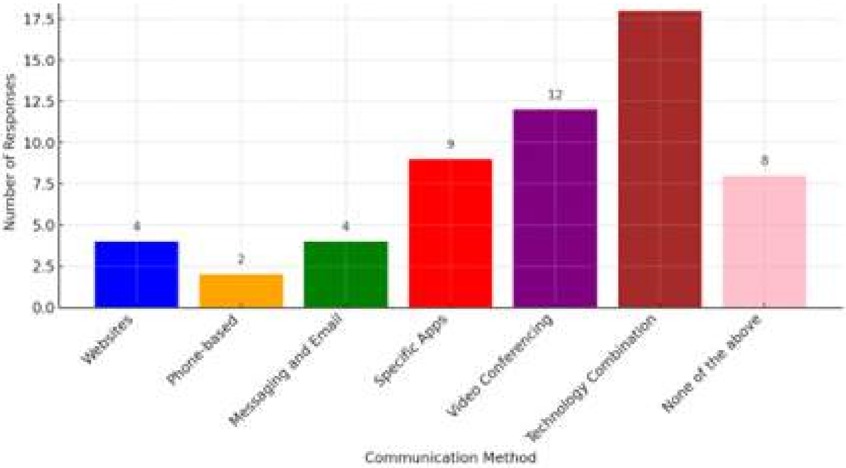
Results

The study included a total of 57 professionals, with 65% being female and nearly half aged 25-34. Among them, approximately one-third had 5-10 years of experience, and 60% held a master's degree. The majority, around 75%, were employed in the private sector. The focus areas were evenly split, with 18 participants each in musculoskeletal problems and orthopedics.

For non-physiotherapist professionals, the study involved 173 participants, with an overwhelming 94% being female. Nearly half were in the 25-34 age group, and over half had a master's degree. Two-thirds had never used physiotherapy services. Attitudes towards telerehabilitation were varied, with 44% remaining neutral and about 25% in agreement with its benefits.

Regarding telerehabilitation, opinions were evenly split, with 24 physiotherapists approving and 24 remaining neutral. Most physiotherapists reported no prior experience with telerehabilitation services. When discussing the integration of technology in therapy, 18 therapists believed that combining physical treatments with technology would be beneficial. A detailed breakdown of the types of technologies considered beneficial is depicted in Figure 1.

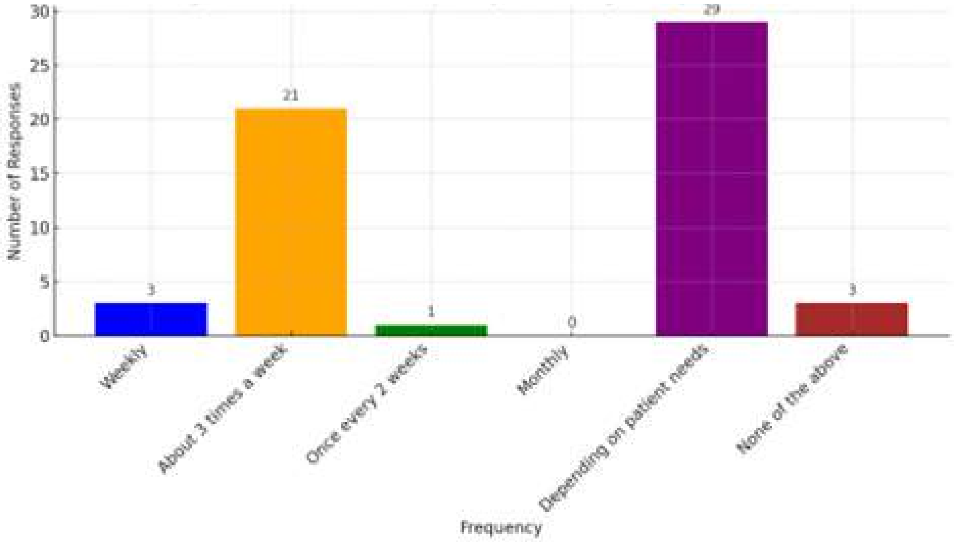
FIGURE 1. Types of Therapeutic Communication Related to Technology as Reported by Physiotherapists



Frequency of Rehabilitation Sessions

The study revealed varying preferences for the frequency of rehabilitation sessions among physiotherapists. Specifically, 29 physiotherapists emphasized the need for tailoring the frequency of sessions to individual patient contexts, indicating a flexible approach to rehabilitation schedules. Conversely, 21 therapists suggested that thrice-weekly sessions would suffice for effective patient management, showcasing a preference for a structured routine (Figure 2).

FIGURE 2. Ideal Time Frequency According to Physiotherapists



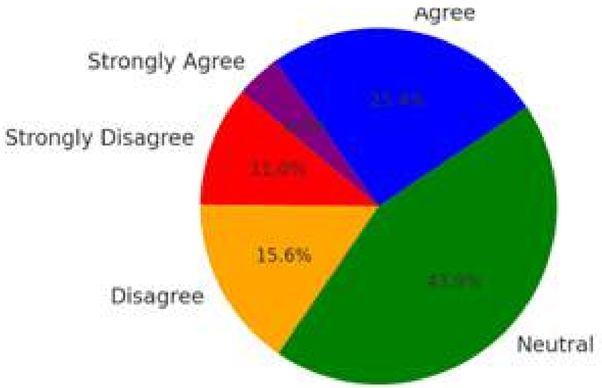
Communication and Support through Telerehabilitation

The preferred methods of communication with patients in the telerehabilitation context were found to be via real-time video conferencing (21 participants) and a combination of pre-recorded and scheduled sessions (26 participants). The survey highlighted a strong endorsement for providing additional health information and education during therapeutic sessions, with 49 therapists in favor. Self-management strategies were also supported by 44 therapists, underscoring their value in the telerehabilitation framework. Moreover, the role of third-party support from family, friends, and caregivers was recognized by 40 therapists as crucial in facilitating therapeutic outcomes. The opportunity for patients to interact through telerehabilitation was deemed valuable by 34 respondents.

Non-Physiotherapist Perspectives on Telerehabilitation

Among the non-physiotherapists surveyed (n=173), primarily females aged 25-34 (n=84 with master's degrees dominating at 93 participants), a significant portion (113) had never previously utilized physiotherapy services. Attitudes toward telerehabilitation were mixed, with 76 expressing neutrality and 44 showing agreement with the service (Figure 3). This diversity in perspectives indicates varying levels of readiness and acceptance towards adopting telerehabilitation among the general population.

FIGURE 3. Agreement with Participation in Tele-Rehabilitation According to the Population



Adaptability and Acceptance of Telerehabilitation Programs

Regarding adaptation to telerehabilitation programs, a significant portion of respondents (n=68) were uncertain if they could adjust to such programs, with opinions equally split between agreement and disagreement (n=43 each). Concerning the availability of necessary equipment for telerehabilitation, 71 participants indicated a lack of proper infrastructure to follow such programs effectively.

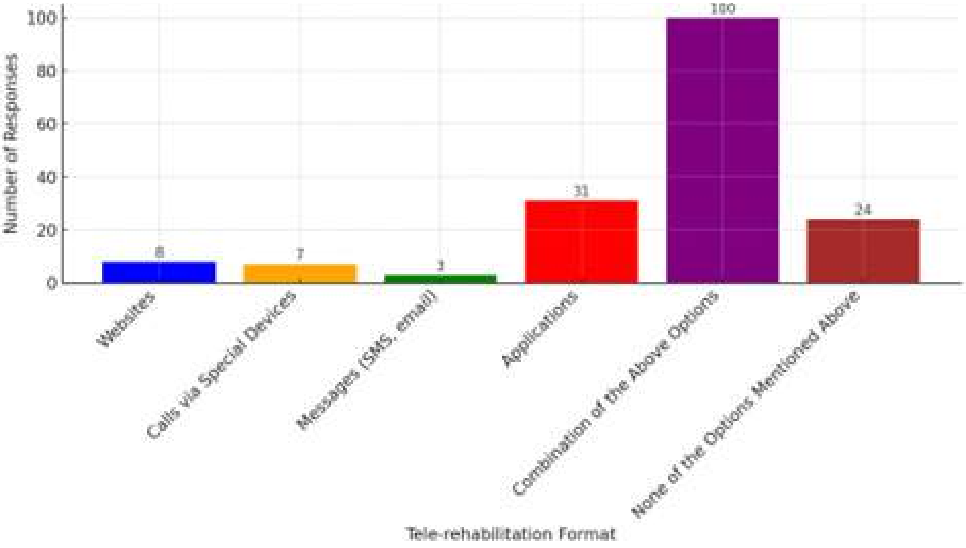
Effectiveness and Cost Concerns of Telerehabilitation vs. Physical Therapy

Participants expressed mixed feelings about the effectiveness of telerehabilitation compared to traditional physical therapy. While 72 participants endorsed the effectiveness of physical therapy, 52 were strongly against replacing it with telerehabilitation, highlighting skepticism about its efficacy. Cost considerations also revealed uncertainty, with 46% (n=80) unable to specify their stance and 30% (n=52) believing telerehabilitation to be costly. Furthermore, when asked if they were willing to pay the same amount for telerehabilitation as for in-person services, 42% (n=72) disagreed, and 38% (n=65) were not in favor.

Technological Support and Communication Preferences

Regarding the technological aspects of telerehabilitation, 100 participants felt that all available digital technologies could aid their treatment, and 31 believed that apps specifically could be helpful. These responses underscore the need for enhanced digital tools and applications to support telerehabilitation practices effectively.

FIGURE 4. Most Suitable Formats of Tele-rehabilitation to Assist Patients



Customization and Preferences in Telerehabilitation

A significant number of participants (n=134) emphasized that the frequency of rehabilitation sessions should be tailored to individual needs. Additionally, the ideal form of contact with therapists was identified as a combination of telerehabilitation with recorded and live video conferences (n=90), indicating a preference for flexible and interactive communication methods.

Preferred Telerehabilitation Features

Participants expressed specific preferences for telerehabilitation features that would enhance their experience. The most favored option was following exercise prescriptions (n=67), followed by self-management strategies (n=44) and health information access (n=39). This suggests a strong demand for comprehensive and supportive digital tools that facilitate active patient engagement and education during the rehabilitation process (Figure 5).

FIGURE 5. Tele-rehabilitation Delivery Options

Community Interaction in Telerehabilitation

The study revealed mixed opinions regarding the integration of community interaction within telerehabilitation programs. While 72 participants found the idea of engaging in group communications and forums interesting, another 69 expressed skepticism about the necessity or usefulness of patient interaction within these platforms. This split highlights varying preferences for social features in telerehabilitation, indicating that while some patients see value in community support, others may prefer a more focused, individual approach to their rehabilitation.

Discussion

The findings indicate a divided opinion among physiotherapists regarding the adoption of telerehabilitation, reflecting a broader hesitation possibly rooted in a lack of familiarity and experience with this service modality. While half of the physiotherapists surveyed were neutral, those in favor recognized the potential benefits of integrating technology into rehabilitation practices. This polarization underscores the need for further education and hands-on exposure to telerehabilitation technologies, similar to the challenges and recommendations identified by previous research, which emphasizes that enhancing user comfort with technology is crucial for adoption (Pramuka M, 2009) Furthermore, the preference for traditional physical therapy among a significant portion of respondents highlights a critical barrier to telehealth—resistance due to perceived effectiveness of face-to-face interactions, as discussed in studies like (Moulaei, 2023), which found that personal interaction remains highly valued by both patients and providers. In contrast, studies that measure attitudes before and after direct experience with telerehabilitation often show a shift towards more favorable views of its efficacy and acceptability. This indicates that direct experience with telerehabilitation can significantly alter perceptions, potentially overcoming initial resistance. It highlights the importance of integrating trial periods or pilot programs into the introduction of telerehabilitation services, allowing both patients and providers to experience the benefits firsthand before forming a concrete opinion (Cramer SC, 2019). Such findings suggest that an effective strategy to promote telerehabilitation in settings like Albania might involve not only educational campaigns but also opportunities for trial uses of the service. This approach would help bridge the gap between traditional perceptions and the potential advantages of telehealth, easing the transition for both healthcare providers and their patients.

The study also highlights a substantial interest in specific features of telerehabilitation, such as video conferencing and pre-scheduled programming, suggesting that a hybrid model of service delivery could be more acceptable. This preference aligns with recent advancements in telehealth that advocate for flexible models accommodating both remote and in-person care components (Pramuka M, 2009). Moreover, the significant support for health education and self-management strategies through telerehabilitation platforms points to an opportunity to enhance patient engagement and autonomy in managing their health, which has been shown to improve outcomes in chronic disease management , (Cox, 2023), (Matamala-Gomez M, 2020). The readiness for adopting such models, however, is contingent upon addressing infrastructural deficiencies, notably in internet connectivity and technological literacy, which mirrors global challenges in telehealth expansion (Palombini, 2023).

Conclusions

The study underscores the potential of telerehabilitation to enhance healthcare accessibility in Albania, highlighting the need for increased awareness and experience among both physiotherapists and the general public. The findings advocate for educational initiatives and pilot programs to familiarize potential users with telerehabilitation's benefits, aiming to reduce skepticism and resistance. Ultimately, the successful integration of telerehabilitation in Albania hinges on strategic efforts to bridge the gap between traditional healthcare practices and innovative telehealth solutions, ensuring equitable healthcare access across diverse populations.

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Assessment of the incidence and prevalence of rheumatoid arthritis in the District of Elbasan for the period 2011-2021

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Abstract

Introduction: *Rheumatoid arthritis (RA) is an autoimmune and chronic disease. Worldwide, the annual incidence of RA is 1%. Epidemiological data for Albania are similar to other countries, still some districts might be more affected. There are no previous studies in the population indicating the prevalence or incidence of rheumatoid arthritis in the Elbasan district.*

Objective: *This study aims to estimate the incidence and prevalence of rheumatoid arthritis in Elbasan district during a decade (2011-2021) according to gender, place of residence and age group and to evaluate the trend of ambulatory visits for RA.*

Methodology: *The population in this retrospective study are all patients hospitalized at the Elbasan Regional Hospital with the diagnosis of rheumatoid arthritis during the period January 2011 - December 2021. The study also evaluated the correlation of different genetic, lifestyle and environmental factors in patients with rheumatoid arthritis in this district.*

Results: *During 2011 - 2021, a total of 2554 cases diagnosed with rheumatoid arthritis were identified, out of them 877 (34.3%) cases were new or incident cases and 1677 (65.7%) chronic or existing cases or prevalent cases. Incident cases ranged from 30.2/100,000 to 58.3/100,000 while prevalent cases ranged from 29.7/100,000 to*

201.9/100,000 inhabitants. The incidence of AR according to years in women ranges from 2 to 4 times higher compared to men ($p<0.01$). The highest incidence is in the age group of 45-54 years, 149.3/10000 and in the age group of 55-64 years, 148/10000, with a significant difference with the other age groups. In addition, the incidence in the rural area is higher than in the urban area, with a significant difference between them.

Conclusions: *This study provides a broad overview of the incidence and prevalence of RA in the district of Elbasan over a relatively long-time span.*

Key words: *Rheumatoid arthritis (RA), Incidence, Prevalence, Elbasan*

Introduction

Rheumatoid arthritis (RA) is an autoimmune, chronic, multisystemic, multifactorial inflammatory disease[1]. Although there are a large number of systemic symptoms, the main characteristic of established rheumatoid arthritis is persistent inflammatory synovitis that usually affects peripheral joints symmetrically[2]. But any joint that has a synovial membrane can be affected by inflammation. In this disease, synovial inflammation has the ability to cause cartilage damage and bone erosions with consequences up to ankylosis and disability[3]. The joints that are most often affected in RA are the metacarpophalangeal, radiocarpal, proximal interphalangeal, knee, and to a lesser extent other joints. The course of RA despite the presence of this synovial inflammation may be different[4]. Some patients may have moderate oligoarticular involvement for a short time with minor joint damage, but most have progressive polyarthritis with significant functional impairment[5]. The purpose of the study is to evaluate the epidemiology of rheumatoid arthritis in the district of Elbasan during the period 2011-2021.

Methods

In this retrospective study to assess the incidence and prevalence of RA in the district of Elbasan, the population included in the study is: All patients hospitalized at the Elbasan Regional Hospital with the diagnosis of rheumatoid arthritis during the period January 2011 - December 2021. The data were obtained in the statistics department of Elbasan Regional Hospital. Patients who were hospitalized from other districts of Elbasan district such as Librazhi, Peqini and Gramshi were excluded from the statistics.

The following data were extracted from the cards:

- Demographic and socio-economic characteristics: age, gender, education level (8 years, secondary, high), employment status (employed, unemployed and retired), economic level (low, secondary, high).
- Lifestyle factors: smoking, alcohol consumption, excessive meat consumption, excessive fat consumption.
- Concomitant conditions: obesity, other comorbidities, arterial hypertension, history of angina pectoris, myocardial infarction or heart disease, diabetes.
- Body mass index (BMI). Calculated according to the formula kg/m2.
- Data for outpatients: In the polyclinic and health centers, the number of visits for AR over the years was extracted. It is worth noting that the statistics were not very correct because we judge that not in all cases the correct diagnosis was RA, but nevertheless the epidemiological situation is evaluated taking this limitation into account.

Data analysis: The statistical program SPSS 25.0 was used for data analysis. Continuous variables are summarized as the mean ± standard deviation (SD). The percentage of patients in each category was calculated for categorical variables. The χ^2 test was used to compare percentages between categorical variables. The student's t test was used to compare continuous means. The incidence and prevalence of PR are calculated based on the average population of the period 2011-2021 in total and according to gender, residence, and age group. The p value ≤ 0.05 was considered statistically significant. All statistical tests are two-sided.

Results

In total, during the period January 2011 - December 2021, 2554 cases diagnosed with rheumatoid arthritis were identified, out of them 877 (34.3%) cases were new or incident cases and 1677 (65.7%) were chronic or existing cases or prevalent cases. Total AR cases ranged from 114 to 491 with a significant upward trend during the study period ($p<0.01$). In 2020 and 2021, a decrease in hospitalized cases is observed due to the restrictions during the pandemic.

The number of new and prevalent cases by years

Incident cases ranged from 30.2/100,000 to 58.3/100,000 while prevalent cases ranged from 29.7/100,000 to 201.9/100,000 inhabitants.

TABLE 1. Incidence and prevalence of RA in the district of Elbasan

Year	New cases	Population of the district	Incidence	Existing cases	Population of the district	Prevalence
	(incidence)		/100000	(prevalence)		/100000
2011	65	188662	34.5	75	188662	39.8
2012	57	188662	30.2	92	188662	48.8
2013	73	188662	38.7	134	188662	71.0
2014	71	188662	37.6	96	188662	50.9
2015	58	188662	30.7	56	188662	29.7
2016	74	188662	39.2	110	188662	58.3
2017	82	188662	43.5	149	188662	79.0
2018	86	188662	45.6	254	188662	134.6
2019	110	188662	58.3	381	188662	201.9
2020	99	188662	52.5	169	188662	89.6
2021	102	188662	54.1	161	188662	85.3

The incidence of RA presents a significant increasing trend even during two years of the pandemic.

TABLE 2. Incidence according to years in men and women

Year	New cases	Population: Males	Incidence	New cases	Population: Female	Incidence
	MALE		/100000	FEMALE		/100000
2011	19	95016	20.0	46	93647	49.1
2012	17	95016	17.9	40	93647	42.7
2013	20	95016	21.0	53	93647	56.6
2014	22	95016	23.2	49	93647	52.3
2015	15	95016	15.8	43	93647	45.9
2016	23	95016	24.2	51	93647	54.5
2017	20	95016	21.0	62	93647	66.2
2018	20	95016	21.0	66	93647	70.5
2019	20	95016	21.0	90	93647	96.1
2020	23	95016	24.2	76	93647	81.2
2021	20	95016	21.0	82	93647	87.6

A significant change in the incidence trend of RA was found between women and men. The incidence of RA according to years in women varies from 2 to 4 times higher compared to men ($p<0.01$).

TABLE 3. Incidence according to years in urban and rural areas

Year	New cases urban area	Population: urban area	Incidence /100000	New cases Rural area	Population : rural area	Incidence /100000
2011	29	93492	31.3	36	95170	37.6
2012	25	93492	27.0	32	95170	33.4
2013	33	93492	35.5	40	95170	41.9
2014	32	93492	33.7	39	95170	41.5
2015	31	93492	33.0	27	95170	28.6
2016	41	93492	43.3	33	95170	35.2
2017	37	93492	39.7	45	95170	47.1
2018	38	93492	40.1	48	95170	50.9
2019	47	93492	50.3	63	95170	66.2
2020	46	93492	49.1	53	95170	55.8
2021	48	93492	51.5	54	95170	56.5

In addition, the incidence in the rural area is higher than in the urban area, with a significant difference between them.

TABLE 4. The incidence of cases according to age groups

Age group, in years	New cases	Population	Incidence /10000
0-1	0	3328	0.0
1-4	1	7433	1.3
5-14	3	23439	1.3
15-24	16	31173	5.1
25-34	19	27425	6.9
35-44	82	21856	37.5
45-54	376	25192	149.3
55-64	353	23853	148.0
>65	27	24963	10.8

The highest incidence is in the age group of 45-54 years, 149.3/10000 and in the age group of 55-64 years, 148/10000, with a significant difference with the other age groups.

TABLE 5. The number of ambulatory visits for RA during the period 2011-2021

Year	Number of visits	%
2011	8251	8.7
2012	8322	8.7
2013	8417	8.8
2014	8831	9.3
2015	8113	8.5
2016	8589	9.0
2017	9472	9.9
2018	10469	11.0
2019	11074	11.6
2020	5665	5.9
2021	8134	8.5
Total	95337	100.0

The number of outpatient visits shows an increasing trend over the years, with a decrease only in the two years of the pandemic.

TABLE 6. Sociodemographic characteristics of patients

Variables	Number	%	P
Gender			
Female	658	75.0	<0.01
male	219	25.0	
Age , M (SD)	52.4 (7.5)	[4-83]	
Age group, years			<0.01
<25	20	2.3	
25-34	19	2.2	
35-44	82	9.4	
45-54	376	42.9	
55-64	353	40.3	
>65	27	3.1	
Civil status			<0.01
Single	26	3.0	
Married	776	88.5	
Divorced	37	4.2	
Widow	38	4.3	

Education			<0.01
School	278	31.7	
High school	431	49.1	
University	168	19.2	
Occupation			0.01
Unemployed	111	12.7	
Retiree	381	43.4	
Self employed	143	16.3	
Employed	242	27.6	
Income			<0.01
Low Income	404	46.1	
Average Income	382	43.6	
High Income	91	10.3	
Residence			0.03
Urban	407	46.4	
Rural	470	53.6	

887 patients with RA with a mean age of 52.4 (7.5) years participated in the study, of which 658 (75%) were female and 219 (25%) male. The ratio of women/ men is 3 : 1.

Patients in the age group of 45-54 years (42.9%) and patients in the age group of 55-64 years (40.3%) predominate with significant difference with the younger age groups ($p<0.01$). Married patients predominate (88.5%), followed by divorced and widowed with 4.2% each category and singles (3%), with a significant difference between them ($p<0.01$).

Patients with secondary education predominate (49.1%), followed by those with low education (31.7%) and 19.2% of patients have higher education, with a significant difference between them ($p<0.01$). Retired patients predominate (43.4%), followed by employed (27.6%), self-employed (16.3%) and unemployed (12.7%) patients ($p<0.01$). Patients with low income prevail (46.1%), followed by patients with average income (43.6%), while patients with high income are (10.3%), with a significant difference between them ($p<0.01$). Patients from rural areas predominate (53.6%) compared to patients living in urban areas (46.4%), with a significant difference between them ($p=0.03$).

TABLE 7. Distribution of genetic factors and lifestyle factors

Variables		Male (n=219)	Female (n=658)	P
Genetic factors	No	127 (58.0)	296 (45.0)	<0.01
	Yes	92 (42.0)	362 (55.0)	
Smoking	No	149 (68.0)	559 (85.0)	<0.01
	Yes	70 (32.0)	99 (15.0)	
Alcohol consumption	No	153 (69.9)	592 (90.0)	<0.01
	Yes	66 (30.1)	66 (10.0)	
High consumption of meat	No	131 (59.8)	526 (79.9)	<0.01
	Yes	87 (39.7)	132 (20.1)	
High fat consumption	No	164 (74.9)	507 (77.1)	0.5
	Yes	55 (25.1)	151 (22.9)	
Obesity	No	157 (71.7)	395 (60.0)	<0.01
	Yes	62 (28.3)	263 (40.0)	
Arterial hypertension	No	153 (69.9)	447 (67.9)	0.6
	Yes	66 (30.1)	211 (32.1)	
Diabetes	No	186 (84.9)	554 (84.2)	0.8
	Yes	33 (15.1)	104 (15.8)	
Heart dissases	No	175 (79.9)	549 (83.4)	0.2
	Yes	44 (20.1)	109 (16.6)	

Genetic factors prevail among women (55%) compared to men (42%), ($p<0.01$). Also, smoking (32%) and alcohol (30.1%) predominate among men ($p<0.01$). Exaggerated meat consumption was much higher in males (39.7%) compared to females (20.1%) with a significant difference ($p<0.01$). No significant difference was found regarding fat intake between men (25.1%) and women (22.9%) ($p=0.5$). Overall obesity (BMI>30) was higher in women (40%) compared to men (28.3%), with a significant difference with men (28.3%) ($p<0.01$). No significant difference was found between men and women in terms of the frequency of HTA (p=0.6), diabetes (p+0.8) and heart disease (p+0.2).

Discussion

Worldwide, the annual incidence of RA is approximately 3 cases per 10,000 population and the prevalence rate is approximately 1%, increasing with age and peaking between 35 and 50 years of age. In population-based studies in developed countries, it has been reported by most serious literature sources that the frequency of rheumatoid arthritis ranges from 0.5%-1.0% of the adult population[6] . International literature also reports that rheumatoid arthritis is a disease that affects women three times more than men[7] . In our study, in the contingent of users of primary health services, there was also evidence of a gender gradient, where the proportion of cases with rheumatoid arthritis in women was 2 to 4 times higher compared to men.

The literature data are comparable to this study regarding incidence, age of onset and gender. According to contemporary literature, the prevalence of rheumatoid arthritis is increasing among individuals in both sexes. In our study, we obtained an evidence similar to the reports of the world literature on this point and evidenced a greater proportion of elderly cases with rheumatoid arthritis in both genders[8] .

In fact, until now there are no data based on studies in the population on the prevalence or incidence of rheumatoid arthritis in the Elbasan district. From this point of view, the present study is a novelty for our country. This is because studies based directly on the population are very difficult to carry out and the fact is that data on the incidence or prevalence of rheumatoid arthritis are missing for most of the populations of the countries of our region. International literature, mainly that of industrialized or developed countries, estimates that the frequency of rheumatoid arthritis varies/changes according to the methods used to determine the presence of this disease. The prevalence of rheumatoid arthritis has significant geographic variation[9] .

This disease is more frequent in Northern European and North American countries compared to many developing and/or transitioning countries and regions, such as rural areas in West Africa[10] .It has been suggested that these geographic changes may be related to different genetic predispositions, but also to environmental factors that expose different individuals to different levels of risk for the development of rheumatoid arthritis in different areas and regions of the world[11] . The data of the study are similar to other studies also in terms of lifestyle factors[12] .

Regarding the other risk factors for the development of rheumatoid arthritis, smoking and excessive alcohol consumption were more frequent etiological factors in the contingent of male patients compared to females(13,14) , this fact is present in the literature as well.

Conclusion

The results of this study shed light on a new and very important evidence on the incidence and prevalence of RA in the district of Elbasan. This paper specifically provides a detailed overview of the incidence and distribution of RA in the rural and urban area of this district. It identifies some of the risk factors for the development of RA in this population. The study examines in detail the impact and specific role of lifestyle factors such as smoking, excessive alcohol consumption, meat and fat consumption in the etiology of RA. The influence and association of RA with other chronic diseases such as cardiovascular diseases (arterial hypertension, angina pectoris, myocardial infarction), diabetes, etc.

Recommendations

Although a large number of environmental and hormonal factors have been implicated in the etiology of rheumatoid arthritis, conflicting results are reported with most of them, making necessary the development of other more significant studies. However, smoking is confirmed as an important risk factor in the etiology of rheumatoid arthritis. Therefore, it is necessary to work in the fight against smoking with patients in medical clinics but also with the population as a whole, not only for the prevention of rheumatoid arthritis but, at the same time, for the prevention of a large number of other diseases caused by smoking (including cardiovascular disease and bronchial cancer).

The strategy in the fight against smoking would be very fruitful and effective, especially for individuals who have a genetic predisposition for the development of rheumatoid arthritis, and smoking in these subjects is an explosive factor of this disease. The current study emphasizes that understanding which environmental factor may influence the initial immune processes that drive the development of disease, chronicity, and co-morbidities (other diseases) that accompany rheumatoid arthritis is of fundamental importance for any effort to the prevention of rheumatoid arthritis and all the consequences of this disease. This paper proves and documents the fact that, currently, on a global scale, little progress has been made on the impact of environmental factors on the initial immune processes that promote the development of rheumatoid arthritis, since there are very few resources in this field of Rheumatology, including the countries or societies most advanced Western.

Therefore, there is a natural need to invest in scientific research. Innovations and technologies related especially to prevention, but also to early diagnosis and cost-effective treatment of rheumatoid arthritis in the population.

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Pneumomediastinum as a primary manifestation of COVID-19: A case report

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Abstract

Introduction: *Pneumomediastinum is a rare complication that occurs in patients with Pneumonia caused by COVID-19 and is more frequent in patients with ARDS that may or may not be related to the use of invasive mechanical ventilation. Pneumomediastinum is an indicator of clinical deterioration with potentially threatening consequences for the patient.*

Method: *We described a case report of a 23-year-old man with Pneumomediastinum, infected with COVID-19 in conditions of respiratory failure due to interstitial pneumonia.*

Case presentation: *A 23-year-old man, who had no pre-existing health conditions presented to the Infectious Diseases service with complaints of difficulty in breathing, dry cough, chest pain, muscle pain, joint pain, loss of taste, sore throat, pronounced body weakness, diarrhea. Symptoms started 11 days ago. On admission the patient refers that he doesn't suffer from any other disease. The patient was not vaccinated against COVID-19. At the time of admission to the hospital, the objective examination revealed cervical subcutaneous emphysema and harsh respiration in both lungs. The nasopharyngeal swab test (RT-PCR) for Covid-19 was positive from the Institute of Public Health. The CT scan of the chest confirmed the presence of pneumomediastinum major, subcutaneous emphysema and bilateral ground glass opacities.*

Conclusion: *Pneumomediastinum is a rare complication of pneumonia caused by Covid-19 in which the etiopathogenesis consists of severe pulmonary involvement that may or may not be affected using invasive mechanical ventilation. Timely diagnosis of pneumomediastinum in patients with Covid-19 would prevent the occurrence of life-threatening complications.*

Keywords: *Covid-19, pneumomediastinum, ARDS, Macklin effect, vaccine.*

Introduction

Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus which also caused the covid-19 pandemic causing a global health emergency.[1] Pneumomediastinum describes the presence of free air in the mediastinum.[2-4] It can be classified as: primary pneumomediastinum, which is also called spontaneous pneumomediastinum and is defined as the presence of air in the mediastinum without any specific cause. Spontaneous pneumomediastinum (SPM) is an unusual complication of viral pneumonia and SARS-CoV-2 is a new "nosology" in the etiology of SPM.[2-4] There are several predisposing and stimulating factors for the development of SPM. Predisposing factors include current or past smoking, recent respiratory infections, and substance abuse. Common precipitating factors include coughing and vomiting. Secondary pneumomediastinum develops as a result of a specific pathology or damage to the chest resulting in intrathoracic dissection of air through the mediastinal planes.[2-4]In any patient with COVID-19 presenting with chest pain and breathlessness pneumomediastinum should be considered in the differential diagnosis.[5,6]

The incidence of spontaneous and secondary pneumomediastinum is higher in patients with COVID-19 compared to the general population.[5,6]

Pneumomediastinum should be considered in the differential diagnosis of any patient with COVID-19 presenting with chest pain and breathlessness. The studies have shown that in patients with COVID-19 the incidence of pneumomediastinum is higher (1:5498) than in the general population (1:7000 to 1:45,000).[5,6]The survey by UK POETIC reported the incidence of PMS in individuals with COVID-19 at 0.13%, which is almost 6000 times higher than in the general population (0.00002%).[7,8]The incidence of spontaneous and secondary pneumomediastinum is higher in patients with COVID-19 compared to the general population.

The gold standard for diagnosis of Pneumomediastinum is CT (computed tomography) of the chest.[9-15]The Macklin effect (known by radiologists since 1964) could be detected on CT as linear collections of air contiguous to the broncho vascular sheaths in patients with SPM.[16-19]In 2021, Belletti et al. conducted an observational study on patients with COVID-19 and found that 95% of those who developed pneumomediastinum demonstrated the Macklin effect on CT of the chest. Therefore, the Macklin effect on CT is a strong predictor of the subsequent development of pneumomediastinum.[20]

Method

We described a case report of a 23-year-old man, presented to the Infectious Diseases service with complaints of difficulty in breathing, dry cough, chest pain, neck pain, muscle pain, joint pain, loss of taste, sore throat, pronounced body weakness and diarrhea. These complaints had started 11 days ago as referred by the patient. The patient was not vaccinated against COVID-19. He doesn't suffer from any other disease and does not smoke. At the time of admission to the hospital, objective examination revealed cervical subcutaneous emphysema and a harsh respiration in both lungs. On the day of hospitalization, the temperature was 38° C, tachypnea 22`, blood pressure was 150/73 mmHg and saturations SO2- 89 % in room air in lying position and SO2 94% under 10 l/min oxygen support with a facial mask. In hemogram tests we noticed elevated of White blood cells 10.1 K/µL and Neutrophils 88.8 % and low levels of Lymphocytes 9.6 %. Also in biochemical blood test was noticed elevated of Glucose 129 mg/dL, LDH 956 U/L, CK 723 U/L, AST 55 U/L and urea test was high 49.8 mg/dL. In other laboratory tests, we noticed increased inflammatory markers as PCR 17.91 mg/dL (normal range<0.5 mg/dL), Fibrinogen 738 mg/dL (normal range 200-400 mg/dL), D-Dimer 0.52 µg/mL (normal range <0.5µg/mL), Ferritin 1404.53 ng/mL (normal range 5-204 ng/mL).In astrupogram was noticed: PO_2 45.3 mm Hg (decreased of PO2), PCO_2 36.2 mm Hg, PH 7.459, $cHCO_3$ 25.1 mmol/L, BE 1.6 mmol/L, SO_2 83,7 %.The nasopharyngeal swab test for Covid-19 was verified by reverse transcriptase – protein chain reaction (RT-PCR) positive from the Institute of Public Health. The CT scan of the chest confirmed the presence of pneumomediastinum major, subcutaneous emphysema and described bilateral ground glass opacities. Dynamic follow-up by the thoracic surgeon, where drainage was performed on the second day of hospitalization in the cervical area of subcutaneous emphysema. Continue treatment with O2-therapy and cortisone. On the 3rd day of admission in CT scan of the chest and X-ray chest was seen: Pneumomediastinum and subcutaneous emphysema and minimal Pneumothorax. On 4rth day of admission was seen moderate subcutaneous emphysema and no indication for surgical treatment. On 7th, 8th and 9th day of admission the situation is better, without other imaging and clinical changes. On 10th day of the event in X-ray chest was noticed the situation improved and it was decided to remove the drains in the cervical area. On 12th day of the event in CT scan of lung was seen minimal Pneumomediastinum. On 14th day of admission in X-ray chest noticed air resorption in both lungs and minimal pneumomediastinum. At the beginning of the 2nd week of hospitalization the clinical signs began to improve , there was a decrease in inflammatory markers and the gradual decrease in the need for oxygen. During the hospitalization patient was treated with a combined therapy with antibiotic-Tazobactam 4.5 g, ivx3, Levofloxacine 0.5 g/100 cc, ivx1, cortisone-Dexamethazon 4 mg, 3x2 amp iv; anticoagulant Dalteparine 5000 UI/0.2 cc, 2x1 s.c; O_2-therapyaccording to SO_2 (15 l/min $O_2$with facial mask) and supportive therapy. Tocilizumab 400 mg/20 mL, 2 fl was applied on the first day of hospitalization (second fl after 12 hours after the first dose).Tocilizumab is an monoclonal antibody blocking IL-6 receptors and it is used because of benefits in hospitalized severe COVID-19 patients[28].The patient was discharged at home in an improved condition after 18 days of hospitalization with no need support of oxygen.

FIGURE 1: CT scan of the lungs confirmed the presence of pneumomediastinum major. (a) subcutaneous emphysema (b) described bilateral ground glass opacities.

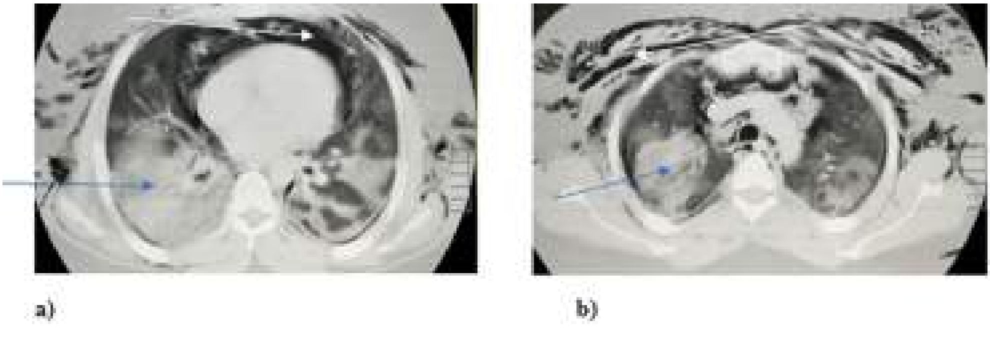

FIGURE 2: On 12th day of the event in CT scan of lung was seen: (c) minimal Pneumomediastinum and (d) consolidation ground glass opacity.

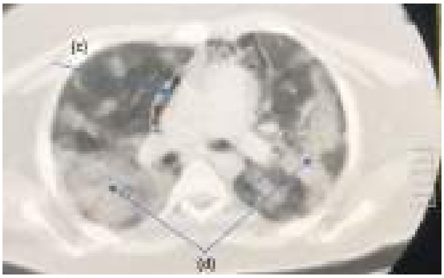

FIGURE 3: X-ray of chest on 14th day of admission, we noticed air resorption in both lungs and minimal pneumomediastinum.

Discussion

The COVID-19 pandemic caused by the SARS-CoV-2 virus confronted us with a new and unknown pathology which was accompanied by numerous complications such as pneumomediastinum. Pneumomediastinum is an indicator of clinical deterioration with potentially threatening consequences for the patient.[21,22,23]Spontaneous pneumomediastinum is an uncommon but usually benign and self-limiting condition which most often occurs with chest pain and sometimes combined with dyspnea. This complication is generally caused by sudden increase in the thoracic pressure where the air dissects along the broncho vascular structures into the mediastinum resulting in alveolar rupture.[24] Currently due to the COVID-19 pandemic, there are reports of pneumomediastinum as a rare complication of COVID-19 pneumonia. Pneumomediastinum could result directly from the pathogenesis of SARS-CoV-2 (rupture of pulmonary bullae) or secondary to intensive care management due to airway trauma during tracheal intubation, barotraumas or repositioning maneuvers.[25,26,27]In fact for our case report, we did not find that this complication was due to iatrogenic causes because patient came to our clinic with subcutaneous emphysema and in the day of hospitalization in CT chest was noticed the presence of air in mediastinum so major pneumomediastinum. During the course, on the 3rd day of hospitalization in CT scan of the chest and X-ray chest was seen except of Pneumomediastinum and subcutaneous emphysema and a minimal Pneumothorax. So the pneumomediastinum observed in our case was apparently not related to a violation of the aerodigestive track and this complication was associated with a worse prognosis.[25]Dynamic follow-up by the thoracic surgeon was done every day. In laboratory tests, we noticed increased inflammatory markers as PCR 17.91 mg/dL, Fibrinogen 738 mg/dL D-Dimer 0.52 µg/mL and Ferritin 1404.53 ng/mL. We started immediately treatment with a combined therapy with antibiotic, anticoagulant , O_2-therapy according to SO_2 and supportive therapy. In addition to the therapy mentioned above, based on guidelines Tocilizumab is also used for the treatment of the case. Tocilizumab 400 mg/20 mL, 2 fl was applied on the first day of hospitalization (second fl after 12 hours after the first dose).Tocilizumab is an monoclonal antibody blocking IL-6 receptors and it is used because of benefits in hospitalized severe COVID-19 patients[28]. Considering the main role of IL-6 in COVID-19 induced cytokine storm, to target hyperinflammation during SARS-CoV-2 infection via the blockage of IL-6. Tocilizumab is a competitive inhibitor of both the membrane-bound and soluble IL-6 receptor, preventing downstream signal transduction of IL-6. Early studies showed that treatment with Tocilizumab in COVID-19 patients brought promising results.[29,30]Several multi-center cohort studies inspected the efficiencies of tocilizumab in COVID-19 patients and revealed a correlation of early Tocilizumab administration with lower mortality rates among critically ill COVID-19 patients with a rapid disease trajectory.[31]Using Tocilizumab demonstrated high safety in hospital conditions because COVID-19 patients receiving Tocilizumab do not show higher incidences of adverse events, including secondary infections and hepatotoxicity.[32]So, our patient recovered by using these combined therapy and after 18 days of hospitalization was discharged at home in an improved condition with no need support of oxygen.

Conclusion

Pneumomediastinum is a rare complication of pneumonia caused by Covid-19 in which the etiopathogenesis consists of severe pulmonary involvement that may or may not be affected by the use of invasive mechanical ventilation[21,22,23]. Timely diagnosis of pneumomediastinum in patients with Covid-19 would prevent the occurrence of life-threatening complications in patients and minimize hospitalizations. Vaccination against covid-19, especially in patients with comorbidities, has a special importance in preventing life-threatening complications in these patients.

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Literature review of Alzheimer's disease aetiology

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Abstract

Introduction: *The most prevalent neurodegenerative illness and kind of dementia is Alzheimer's disease (AD). It shows up as a reduction in short-term memory and cognitive function that affects day-to-day functioning. The majority of Alzheimer's cases are idiopathic, but a tiny percentage of hereditary instances provide gene identification, which when combined with neuropathology provides crucial hints regarding the broader causes. The development and course of the illness are influenced by metabolic and environmental risk factors, such as vascular impairment and inflammation. We still don't fully grasp how neuronal shrinkage and synaptic loss occur across the cerebral cortex. The aim of this review paper is to give a concise overview of AD and its pathogenesis.*

Methods: *Relevant terms were applied to several databases (including CENTRAL; CINAHL; EMBASE; Medline Ovid; and PubMed NCBI) to search for studies exploring aetiology of AD.*

Result and discussion: *Eight etiological theories have been identified based our database search. These include: 1) The aging process; 2) The deterioration of cholinergic and cortical anatomic channels; 3) Environmental factors; 4) Genetic causes; 5) Metabolic malfunction resulting from defects in the mitochondria; 6) Blood/brain barrier impairments; 7) Immune and viral aetiology.*

Key word: *Alzheimer's disease, aetiology, Theory of Aging, Cholinergic hypothesis*

Introduction

The clinical pathological features of Alzheimer's disease (AD) have been mainly examined in terms of three major outcomes in the years after Alois Alzheimer gave the first clinical description of dementia in 1907 (Small & Cappai, 2006). They are the formation of senile plaques (SP), the emergence of neurofibrillary tangles (NFT), and cognitive decline (Massano et al., 2012; Scheltens et al., 2021). Kraepelin first proposed the condition's medical term in 1910 following a review of clinical and pathological findings on dementia patients who had already been diagnosed. Two of these reports were made by Alzheimer, and both patients had numerous SPs. Only one, nevertheless, had appreciable NFT levels (Cipriani et al., 2011) (Gallardo & Holtzman, 2019). This revealed that AD might appear with pathological heterogeneity, which makes it extremely difficult for researchers to establish its likely origin (Seelaar et al., 2010). However, a number of experts have put up suggestions to explain why AD manifests in some people. This study will examine some of the more compelling ones, albeit it cannot cover them all. Eight pathologies have been identified based on these beliefs (Table 1):

TABLE 1: Theories to explain why AD develops

1. The acceleration of the aging process 2. The deterioration of cholinergic and cortical anatomic channels 3. Environmental factors, such as exposure to certain metals, brain injuries, and inadequate food. 4. Genetic causes (mutations in presenilin or amyloid precursor protein, variations in apolipoprotein allelic composition)	5. Metabolic malfunction resulting from defects in the mitochondria 6. Blood/brain barrier impairments as vascular triggers 7. Deficient Immune Reaction 8. Coming into contact with a virus

Each hypothesis is given a descriptive description in this review. It includes a summary of its importance to AD research and clinical investigations as well as an assessment of its individual advantages and disadvantages. It is intended to serve as a helpful resource for upcoming studies and others looking into the management of this illness.

Theories explaining the origins of AD

Theory of Aging

According to several experts, AD symptoms are essentially the same as those that come with aging naturally (Trevisan et al., 2019; Villemagne et al., 2011). Age certainly causes the weight and volume of the brain to decrease in a cognitively healthy individual. In important areas, the dendrites and synapses deteriorate while the ventricles enlarge (James et al., 2012). In addition to these symptoms, AD's hallmark clinical traits (NFT and SP) are also present (Dartigues & Féart, 2011; Démonet & Celsis, 2012; Sengoku, 2020). The issue is that the process is manifested more intensely and happens far more quickly than usual.

Research indicates that around 60% of healthy aging individuals do exhibit signs of SPs. In fact, in most cases, it is impossible to distinguish between early phase AD and healthy physical aging in in deceased patients (Mann et al., 1987; Trejo-Lopez et al., 2023). It should be noted that healthy persons have lower amounts of SPs (Sperling et al., 2012). Arriagada et al. (1992) states that practically all healthy adults over the age of fifty-five have SPs. This suggests that early phase AD, elderly healthy brains, and the most advanced phases of the illness might all have a logical pathological transition (Armstrong, 2012; Breijyeh & Karaman, 2020).

Some researchers report that tau-immunoreactive NFT is present in tiny levels in the majority of cognitively normal persons (Crary et al., 2014; Vinters, 2015). In comparison to AD patients, they also exhibit lower levels of astrocytosis and microglial responses (Fakhoury, 2018) . However, NFT is seen in the entorhinal cortex's Lamina II and the hippocampal regions in people without dementia. This makes the debate over whether healthy aging causes NFT to occur heated. There is no unifying clinical opinion at this time.

There are two more age-related shifts that are frequently connected to the onset of AD. The first is the myelin deterioration process, which is accelerated by aging naturally (Papuć & Rejdak, 2018). It should be mentioned, nevertheless, that some scientists think myelin damage only manifests in late phase AD and is essentially supplementary to the destruction of the neurons (Bartzokis, 2004). The decrease in cells inside the locus caeruleus is the second. It provides noradrenaline to the brain and inhibits the microglia's production of Aβ (Giorgi et al., 2017; Heneka et al., 2010; Heppner et al., 2015) .

Degeneration of anatomical pathways

Cholinergic hypothesis

AD is frequently described as Parkinson's disease's "cholinergic" counterpart. It is thought that the substantia nigra is where the degradation of dopamine neurons and their cortical connections begins in Parkinson's disease patients (Hampel et al., 2019). Likewise, an initial investigation into the genesis of AD identified a specific form of deterioration in the vicinity of the cholinergic neurotransmitter (Hampel et al., 2018; Martorana et al., 2010). Previous research has found significant decreases in acetylcholine in AD brains before this (Ni et al., 2013). More recent studies corroborate this, showing a significant decline in acetylcholinesterase (ACHE) and choline acetyltransferase (CAT), especially in more advanced instances (Bagwe & Sathaye, 2022). Furthermore, compared to healthy people, the cerebral cortex responses are 30–50% lower (Bagwe & Sathaye, 2022; Kumar & Singh, 2015).

Cortico-cortical pathways

A sophisticated neuronal network of "modules" and "columns" defines the anatomical structure of the cerebral cortex. Indeed, several findings unequivocally imply that AD is associated with the degradation of these cortical circuits (Braak & Del Tredici, 2018). The idea that AD causes the structural pathways connecting various parts of the cerebral cortex to break down has gained more traction over time (Salat et al., 2010).

Pathogenic protein transfer from cell to cell

One of the first studies to suggest that AD-related impairment could be connected to neurons and their capacity to transport various chemicals was Saper et al. (1987), It specifically makes the case that the mechanism may be shared by synaptic projections in good health. Several recent studies seem to support this theory, stating that cells create pathogenic proteins including tau, α-synuclein, Aβ, and degenerative prion protein (PrPsc) (Braak & Del Tredici, 2011; Gadad et al., 2011; Steiner et al., 2011). They could produce small intracellular accumulations within infected cells.

Environmental factors theory

Numerous environmental factors have been linked to the development of AD. But the majority of research concentrate on one of the three potential causes (table 3). These are exposure to harmful levels of aluminum, the effects of a poor diet, and the aftermath of a brain injury.

TABLE 3: Environmental triggers that linked to AD development

Aluminium

- The majority of the evidence supporting this notion is disputed and coincidental; there is no concrete evidence that coming into touch with particular metals acts as a primary trigger rather than a complicating element(Campbell, 2002; Kawahara & Kato-Negishi, 2011).
- Epidemiological studies have found a weak (and often unconvincing) correlation between aluminum exposure and AD(Colomina & Peris-Sampedro, 2017).
- It's unclear how increased aluminum affects the brain in its entirety. There may be an innate tendency for brains with pre-existing deficits to aggregate aluminum (Armstrong, 2013). Nonetheless, NFT and SP development may be linked to metal interaction.

Head injury

- Primary dysfunction is generally the result of head trauma. It can spread harmful cytokines to parts of the brain that were not previously injured. Consequently, due to increased activity in the nervous system's microglia and immune cells, head traumas may exacerbate pre-existing diseases (Johnson et al., 2010; Kempuraj et al., 2020; Sivanandam & Thakur, 2012).
- A link between head injuries and the development of AD has been suggested by several research. Amyloid precursor protein (APP) is frequently found in the DN around Aβ accumulations and the neuronal perikarya in survivors of severe head injuries (Takahashi et al., 2017). This is consistent with observations made in patients with late-stage AD (Van Den Heuvel et al., 2007).

Diet and malnutrition

- Nutrition and undernourishment
- Abalan (1984) was among the first to connect AD with a bad diet.
- Giving the specimens excessively high quantities of cholesterol during a rabbit research caused a reduction in Aβ (Sparks et al., 1994).
- People with an AD diagnosis who had the family APP gene mutation (APP717, Val-Glycine) were more likely to experience vitamin deficiencies (Armstrong, 2013; Zhuo & Praticò, 2010).

Genetics theory

Numerous studies conducted in the 1990s found strong evidence to support the hypothesis that there is a connection between specific genetic markers and familial AD (Armstrong, 2013; Selkoe & Schenk, 2003) . This led to additional diagnoses being looked at in connection to APP mutations (Jonsson et al., 2012; Levy-Lahad et al., 1995; Muratore et al., 2014) and a considerably wider spectrum of PSEN1/2 mutations, even though some genes are still unknown. Allelic variation within the Apo e locus of chromosome 19 has also been identified as a significant risk factor for patients with late-onset AD (Pericak-Vance et al., 2000; Roses, 1996).

Aβ38 is much lower in the brain's vessel walls. Mutations in the APP are probably the source of this (Armstrong, 2011; Moro et al., 2012). The Amyloid Cascade hypothesis, which has emerged as the most significant paradigm for the molecular pathophysiology of AD during the past 25 years, defines the process (Hardy, 2006; Kirabali et al., 2019).

Nevertheless, PSEN gene mutations are linked to the most common kind of familial AD. Although the influence is probably more of a complicating element than a direct cause, it is thought that these alterations contribute to the decline in Aβ levels (Kabir et al., 2020; Kumar-Singh et al., 2006). Additionally, compared to cognitively sound individuals, AD patients have 2-3 times more allele. Allelic variations within Apo E have been shown to be a significant risk factor for patients with late-onset AD (Bertram et al., 2010; Serrano et al., 2021)

Mitochondrial dysfunction theory

The hypothesis that AD may be associated with defective mitochondria has been the subject of several significant investigations and dates back to the early era (Castellani et al., 2002; Maruszak & Żekanowski, 2011). It should be mentioned that the enlargement and malfunction of mitochondria are among the initial effects of AD development (Cadonic et al., 2016; Castellani et al., 2002). It causes their brain metabolic rate to drop significantly. Furthermore, an excess of maternal inheritance may contribute to a certain amount of the familial accumulation of AD, and this is common to mitochondria. Lastly, it's thought that consuming carbohydrates causes a loss of several important enzymes, like phosphofructokinase and pyruvate dehydrogenase, which are mitochondrial indicators (Castellani et al., 2002; Yan et al., 2020).

Blood brain barrier dysfunction theory

Importantly, there is disagreement among studies about the contribution of cerebral blood vessels to the development of AD (Bell & Zlokovic, 2009; Korte et al., 2020). Some claim that the quantity and frequency of Aβ deposits, as well as the common spatial patterns of the blood vessels, are indicators of deterioration. It's probable that some materials transported between the vessels aid in the formation of these deposits (Bell & Zlokovic, 2009; Yamazaki & Kanekiyo, 2017). However, some studies contend that these geographical tendencies are coincidental and that the presence of substantial amounts of Aβ and capillary profiles is the only reason for them to arise (Kawai et al., 1990; Thal et al., 2010).

The relationship between Aβ deposits in AD patients and blood arteries can be explained in a number of ways. For example, alterations in the smooth muscles of the blood vessel walls or the basement membranes may result in the deposits (Villemagne et al., 2018; Watts et al., 2014; Zlokovic, 2005). According to Tian et al. (2006) research , blood vessels in AD patients undergo detrimental changes. The smooth muscle cells are damaged and the quantity of Aβ decreases. Another possibility is that axon terminals or glial cells that are sensitive to the vessel wall release Aβ (Zlokovic, 2011). Alternatively, transmission may be initiated by deteriorated clusters of capillaries or arterioles near the larger blood arteries. This is a convincing argument since reduced blood vessel function or malfunctioning endothelia are normal outcomes of Aβ loss. As a matter of fact, 90% of AD patients have them %) (Grammas, 2011). There's also a possibility that the strength of the brain's microvasculature is related to the degeneration of neurons and, in particular, the age-stimulated loss of cells(Bonda et al., 2011). It should be mentioned that the severity and stage of the illness likely influence endothelial cell impairment. Studies on AD-stricken mice have shown that endothelial cell activation and death have a direct impact on the decline in Aβ (Wang et al., 2011).

Infectious agent's theory

Wisniewski et al. (1981)'s research offers some evidence in favor of the theory that infection and AD development are related. It's conceivable that a virus causes the microglia and pericytes to become activated, which lowers amyloid. Renvoize et al. (1987) also contend that the herpes simplex virus may be the cause. It may cause abnormal protein secretion, which would result in the existence of PHF and NFT. The spinal fluid of AD patients has been found to contain antibodies against the virus.

Discussion and conclusion

Many theories have been proposed over time to explain why AD develops in some people. This paper's goal is to list the most significant and talk about their importance for AD research and the development of new therapies. Most importantly, any proposed pathology must take into consideration a number of significant elements. The diversity of AD as a clinical illness is the first (a). The fact that it doesn't always progress in the same manner makes it challenging to identify a common cause. Additionally, it needs to address the following: (b) the connection between the illness and aging in general; (c) the similarities between FAD and SAD; (d) the potential for tau and Aβ to be responsive proteins; (e) the function of the cerebral blood vessels; (f) the impact of immune responses; and (g) the observation that some AD patients do not exhibit high densities of NFT or SP.

The ACH and cholinergic explanation-based hypotheses are the ones that have had the most impact and longevity (Kepp, 2016). Nevertheless, even though they are both connected to the disease's aetiology, they may not provide a complete or foolproof solution. The most challenging aspect of evaluating an AD hypothesis is that it is not always possible for a researcher to distinguish between a primary and secondary result. However, there is strong evidence that cholinergic dysfunction plays a role in AD patients, even if it is just related to the degeneration of few areas or modules. Likewise, there are flaws with ACH theories as well. The NFT and SP, for example, could be responsive rather than causative. In actuality, there is no widely accepted explanation explaining how Aβ causes NFT. Consequently, it seems unlikely that cholinergic variables are the primary cause of AD, and further research is needed before ACH ideas can be taken seriously as a potential explanation for the development of AD.

Regarding a few of the less popular ideas, our research has excluded exposure to aluminum or other dangerous metals as a plausible explanation. Nonetheless, some scientists contend that the brain does react immunologically to particular metals. A limited quantity of data indicates that the substance may accumulate in the brain and cause modifications that result in the release of tau and a decrease in Aβ. It is believed that theories about poor diet and brain trauma are markers or risk factors rather than the actual causes of AD development. Likewise, immunological transition and mitochondrial dysfunction are likely reactions to earlier pathogenic processes such as the synthesis of toxic proteins. However, there is a substantial correlation between the illness and a healthy aging process. Importantly, every sign of AD may be partially or fully identified in a brain that is normal and healthy. A decrease in LC neurons during normal aging may have an adverse effect on the blood-brain barrier and raise the chance of acquiring certain degenerative diseases. Lastly, there is strong evidence to support the idea that important anatomical channel degeneration is a major driver for AD transmission across cells.

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Exploring Cognitive Dysfunction as a Secondary Effect of Kidney Disease: Unveiling the Kidney-Brain Interconnection. A Literature Review

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Abstract

Background: *Chronic Kidney Disease (CKD) is increasingly recognized as a systemic condition affecting not only renal function but also various extra-renal systems, including the central nervous system. Cognitive impairment (CI) has emerged as a* *significant concern in CKD patients, manifesting as a spectrum ranging from mild cognitive deficits to clinically relevant dementia.*

***Methods**: A literature research of electronic databases (Pub-med library, NDT articles and Google Scholar covering the period from 2003-to March 2024) were conducted to assess the association of CKD and cognitive impairment. **Results**: This literature review explores the historical perspectives, definitions, clinical significance, methodological challenges, and potential mechanisms underlying CI in CKD. Furthermore, it highlights ongoing research initiatives, structural and hemodynamic similarities between the kidney and brain. **Conclusions:** Increasing clinician's awareness of CI in CKD is essential to improving its early identification. Therefore, the early identification of possible precursors of CI and the diagnosis and prevention of it is of increased importance. Due to the complexity of CKD, there is tremendous need for increased multidisciplinary team for future directions in this ever-expanding area which is pivotal to our patient's quality and quantity of life.*

Keywords: Cognitive impairment, chronic kidney disease, kidney-brain axis

Introduction

In recent years, the complex interplay between kidney dysfunction and cognitive decline has emerged as a focus of attention in research and clinical interest. Chronic Kidney Disease (CKD), a systemic condition characterized by progressive loss of renal function, has an increasing recognition not only affecting the kidneys but also a decisive impact on extra-renal systems, including the central nervous system (CNS)[1]. Among the diverse of neurological complications

associated with CKD, cognitive impairment (CI) is most prominent which is accompanied by symptoms such as depression and sleep disturbances. CI encompasses a spectrum of cognitive deficits ranging from mild impairment to clinically relevant dementia[2].

The connection between kidney dysfunction and cognitive decline has been underexplored, specifically focusing on renal outcomes. However, increasing evidences have highlighted the interconnection between CKD and cognitive impairment, leading to a fundamental change in our understanding of these interconnected conditions[3]. This review seeks to provide a comprehensive overview of the historical context surrounding CI in CKD, tracing its evolution from an under evaluated aspect of kidney disease to a clinically significant complication[4] Through the analysis of the historical genesis of CI and its disclosure as a crucial area of research, we aim to emphasise the importance of addressing cognitive dysfunction in the management of CKD.

In addition, this literature review aims to clarify the clinical definitions and diagnostic criteria for CI in the context of CKD. Through explanation of the various definitions and criteria used to assess CI in CKD patients, we aim to provide clinicians and researchers of this area with a comprehensive framework for CI in CKD and this often-neglected complications. As CI encompasses a wide spectrum of cognitive deficits, ranging from subtle changes in memory and attention to profound impairment in executive function, a clear understanding of its clinical presentation is essential for correct diagnosis and management[5]. Furthermore, this review seeks to lay the groundwork for future research aimed at unravelling the complex interplay between kidney dysfunction and cognitive decline in CKD.

Historical perspective of kidney-brain axis

The historical perspective on the relation between CKD and cognitive dysfunction reveals a complex interaction between renal function and cognitive health. This two-way relationship, referred to as the kidney-brain axis, underscores the significant impact CKD can have on cognitive function[6]. From a common observation among CKD patients, CI can manifest in various forms, ranging from mild deficits to clinically relevant dementia. Perceiving CI in an early stage and implementing appropriate management strategies are crucial to mitigating its destructive effects on patients' quality of life. In some cases, are frequently associated with the progression of diseases and premature mortality[7].

In the framework of cognitive impairment, different definitions and stages would contribute to the progression of cognitive decline in CKD populations. According to clinical criteria CI is defined based on measurable deficits in cognitive domains without impairments in daily functioning. Mild Cognitive Impairment-Global Performance (MCI-GP) serves as an intermediary stage between normal cognitive aging and dementia[8]. These definitions provide a background for understanding the continuum of cognitive decline and the varied presentations of CI among CKD patients[9].

The apparency of MCI in CKD community has highlighted the need to recognize this condition as a distinct clinical entity, MCI-CKD. MCI, otherwise called as a "time bomb" in CKD requires an immediate attention (a multifaceted approach including early detection, comprehensive assessment, and targeted interventions to prevent further cognitive decline), due to its widespread impact on cognitive function and overall well-being[10].

A recent initiative known as European CONNECT (Cognitive Decline in Nephro - Neurology European Cooperative Target Action) Project represents a collaborative effort to address the clinical implications of CI in CKD. The CONNECT project, funded by the COST action program, consist in a multidisciplinary network of scientists to explore the genesis and the nature of MCI in CKD patients, from a clinical and a scientific perspective. This initiative, through a coordinated research efforts among researchers, clinicians and stakeholders, seeks to address methodological challenges and facilitate the development of effective treatments for CI in CKD. The CONNECT project aims to improve outcomes for CKD patients affected by cognitive impairment[11].

Overall, understanding the historical perspective of the kidney-brain axes is essential for advancing research and clinical practice in this field. Through collaborative initiatives like CONNECT, healthcare professionals can contribute to the recognition of the MCI-CKD as a distinct clinical entity and addressing its clinical implications. In addition, these types of initiatives enhance the quality of life for CKD patients affected by cognitive dysfunction.

Kidney- Brain Structural and Hemodynamic Similarities: Microvascular Dysfunction

The intricate structural and hemodynamic similarities between the renal vasculature and brain highlight their susceptibility to systemic insults and underscore their potential role in the pathophysiology of cognitive impairment in chronic kidney disease (CKD)[12]. The strain vessel hypothesis, which is gaining ground in recent studies, posits that the microvasculature of both organs is particularly sensitive to changes in blood pressure and volume. Disruption of the blood-brain barrier and the glomerular filtration barrier can lead to albumin leakage, which points to microvascular dysfunction[13]. This pathophysiology may contribute to the observed correlation between renal dysfunction and cognitive impairment in CKD patients, taking systemic vascular health into account to understand cognitive decline.

The macula densa (MD), within the nephron, appears as the central command of the nephron with remarkable neuron-like properties. MD cells play a key role in renal sensory signaling, sensing changes in the local and systemic environment and relaying this information to the central nervous system (CNS)[14]. Key mediators of kidney-brain interaction include MD-derived systemic hormones, such as CCN1 have been implicated in modulating vascular function. Dysregulation of these signaling pathways in CKD indicates their potential involvement in the pathogenesis of cognitive impairment, providing a mechanistic link between renal dysfunction and CNS alterations[15].

The researching of kidney-brain structural and hemodynamic similarities highlights the complex interplay between renal and cognitive function. Knowing and understanding the common pathophysiological mechanisms underlying microvascular dysfunction in both organs (kidney-brain) can help researchers and clinicals gain insight into the mechanisms that drive cognitive impairment in CKD. Moreover, the recognition of MD as a nephron central command underscores the intricate signaling pathways involved in kidney-brain interaction, offering potential targets for therapeutic intervention. (ibid)

Collaboration among nephrologists, neurologists, and researchers in related fields is essential to study further the complexity of this relationship and develop effective interventions for CKD-related cognitive impairment. Unraveling the molecular and cellular mechanisms underlying the kidney-brain interface helps researchers identify new therapeutic targets aimed at mitigating cognitive decline in this vulnerable population. These findings, in addition to contributing to knowledge about the kidney-brain connection, emphasize the importance of considering systemic factors in the assessment and management of cognitive impairment in patients with CKD.

Methodological challenges in the field of cognitive function among CKD patients

Methodological challenges in studying cognitive function among patients with chronic kidney disease (CKD) present significant obstacles to advancing our understanding of this complex relationship. Preclinical studies with animal models provide an insight into the pathophysiology of cognitive impairment (CI) in CKD. However, these studies are often limited by small sample sizes and lack of randomization, which hinders the transposition of findings into clinical practice[16]. The predominance of observational field studies requires longitudinal investigations to better define the trajectory of cognitive decline in CKD populations, addressing evidence gaps regarding the natural history of CI in this context[17].

Diverseness of CKD presents challenges in presenting results in research studies to explain the impact of different etiologies, disease stages, and treatment modalities on cognitive function[18]. Advanced and methodological assessments of glomerular filtration rate and comprehensive assessment of comorbidities are very important to increase the validity and generalizability of research findings[19]. However, its determined that albuminuria, estimated GFR and vintage of dialysis are important risk factors for MCI-CKD. *A*ddressing the aforementioned challenges helps researchers better understand the variations of cognitive impairment in CKD and tailor interventions to meet the diverse needs of affected individuals.

Accurate assessment of cognitive function in CKD patients is further complicated by age-related changes and the presence of comorbidities, which can confound test results and lead to underdiagnosis of cognitive impairment[20]. The lack of routine screening for cognitive dysfunction in CKD populations exacerbates this issue, potentially leading to missed opportunities for early identification and intervention[21]. Standardized cognitive assessments, such as the Montreal Cognitive Assessment, offer a valuable tool for identifying cognitive deficits in CKD patients[22], which is validated so far only in hemodialysis. However, these assessments must be carefully interpreted in the context of CKD, considering factors such as disease severity and treatment modalities[23,24].

Addressing methodological challenges and biases in the field of cognitive function among CKD patients is essential to advance research and improve clinical care in this area. By overcoming these obstacles, researchers can enhance our understanding of the mechanisms underlying cognitive impairment in CKD and develop more effective strategies for early detection and intervention. Collaborative efforts between researchers, clinicians, and stakeholders are crucial to address these challenges and improve outcomes for CKD patients affected by cognitive dysfunction. Through interdisciplinary collaboration and methodological rigor, the field can move closer to unraveling the complexities of cognitive impairment in CKD and improving the lives of affected individuals[25].

Perspectives for new studies

Some ambiguity continues to persist in the field of cognitive impairment associated with chronic kidney disease (CKD), highlighting the need for further research into the diagnosis, natural progression, and management of mild cognitive impairment in CKD (MCI-CKD). An important question arises regarding the definition of the difference between MCI-GP (Mild Cognitive Impairment-Global Performance) and MCI-CKD. While MCI-GP serves as an intermediate stage between normal cognitive aging and dementia in the general population[26], it remains unclear whether MCI-CKD represents an exceptional phenotype or simply an accelerated manifestation of MCI-GP within the context of CKD. Clarifying this distinction is essential for adapting diagnostic and therapeutic approaches to the specific needs of CKD patients.

Evidencing the contribution of conventional cardiovascular risk factors to the development and progression of MCI-CKD represents another critical aspect of research[27]. While CKD is associated with an increased risk of cardiovascular disease[28], the extent to which traditional risk factors such as hypertension, diabetes mellitus, and dyslipidemia influence cognitive decline in CKD patients remains unclear[29]. Advanced research on the interplay between CKD-related factors and traditional cardiovascular risk factors may provide valuable insights and findings into the pathophysiological mechanisms underlying MCI-CKD and targeted interventions to mitigate cognitive decline in this population[30].

Establishing stable diagnostic criteria for MCI-CKD presents another challenge for joint research efforts. Currently, diagnostic criteria for MCI in CKD are based primarily on clinical assessments of cognitive function, which may lack specificity and ability to capture cognitive deficits in this population[31]. The development of standardized and validated diagnostic criteria tailored to the unique characteristics of CKD patients is essential for accurate and timely identification of MCI-CKD, addressing the implementation of early intervention and management strategies.

In addition, addressing the therapeutic potential and socio-economic burden of MCI-CKD requires interdisciplinary collaboration and comprehensive research. While various interventions, mainly pharmacological and non-pharmacological approaches, have been explored for treating cognitive impairment in CKD, their efficacy and safety remain uncertain. Moreover, the socio-economic impact of MCI-CKD, including its effects on healthcare utilization, quality of life, and caregiver burden, merits further researching to contribute in designing healthcare policy and resource allocation.

Addressing issues that require explanations on the diagnosis, natural history, and management of MCI-CKD represents an urgent need in the field of nephrology and cognitive neuroscience. Examination of the distinct characteristics of MCI-CKD, comprehensibility of its underlying pathophysiological mechanisms and therapeutic strategies, would help researchers in advancing the understanding of this complex condition and improve outcomes for CKD patients affected by cognitive impairment. Interdisciplinary collaboration and joint research efforts are essential to address these critical questions and pave the way for advancements in the diagnosis, treatment, and prevention of MCI-CKD.

Conclusions

CI stands as a significant burden among CKD patients. Despite advances in research, numerous gaps persist in comprehending the underlying pathophysiology and clinical management of Mild Cognitive Impairment in CKD (MCI-CKD). Addressing the complexities on cognitive dysfunction in CKD and developing effective interventions to alleviate its impact on patient well-being, requires an urgent attention from the scientific community.

Moving forward, future studies are essential in improving our understanding of MCI-CKD. Longitudinal follow-up is essential to elucidate the natural history of

MCI-CKD and to identify prognostic factors associated with disease progression. These studies should include diverse patient populations to capture the heterogeneity of CKD and its cognitive manifestations. Furthermore, comprehensive cognitive assessments, including both traditional neuropsychological tests and novel biomarkers, are imperative to provide a holistic assessment of cognitive function in CKD patients.

Additionally, jointed efforts are needed to bridge the gap between research findings and clinical practice in the management of MCI-CKD. This means developing evidence-based guidelines and best practices for the early detection, diagnosis, and treatment of cognitive impairment in CKD patients. Multidisciplinary collaboration among nephrologists, neurologists, psychologists, and other healthcare professionals is essential to enhance patient care and improve outcomes in this developing field. By addressing these challenges and advancing our understanding of MCI-CKD, we can strive towards improving the quality of life and prognosis for CKD patients affected by cognitive dysfunction.

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