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Role of Gender of Multimorbid Patients in the Treatment provided by their General Practitioners

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Table of Contents

List of Tables

Abstract

Background: General practitioners are the first point of contact for patients and their workload is increased by frequent visits of patients with multimorbidity, making it very difficult for them to manage these patients as they require more consultation time. General practitioners' perception in patients' diagnosis and treatment often leads to under- or overdiagnosis of certain medical conditions when there is a bias towards any gender. Research shows the prevalence of multimorbidity patterns as women having affinity for anxiety, depression, somatoform disorders and pain while men for cardiovascular and metabolic disorders. Literature has evidence that women are treated differently than men for certain conditions. The **objective** of this study is to find out whether the gender of the multimorbid patient affects the treatment provided by their general practitioners.

Methods: This is a cross-sectional observational study. The data was collected by telephonic interviews using standardized EQ-5D questionnaire and EUROPEP instrument. STATA 15.1 was used for statistical evaluations.

Results: The EQ-5D questionnaire reflected majority of the patients in our sample size (n=64) healthier. Assessment of patient satisfaction yielded statistically significant differences between genders for three EUROPEP items where women rated "confidentiality of patient information" (p-value 0.03) and "access to the general practitioner via phone" (p-value 0.04) better, while men for "waiting times at the practice" (p-value 0.04). Regression analysis models showed potential association of EQ-5D scores with patient satisfaction for organization of care (p-value 0.049).

Conclusion: The results could not emphasize on the gender bias strongly and significantly, in depth research in future is needed for further confirmation.

1. Introduction

Germany is struggling with the demographic change due to its increased life expectancy. It has maintained low fertility rates for the longest time and the mid-1960s “baby boom” population is currently in their retirement age, all favoring the demographic structure for the older age population (Bundesministrium des Innern, 2011). The trend of the aging population is seen worldwide, where many countries have shown over 20% of their population to be older than 65 years of age. However, the proportion of women in the older population is increasing consistently with the advancement of age (Rochon et al., 2021) (United Nations, Department of Economic and Social Affairs, Population Division, 2017).

A similar imbalance of sex in the older population is also seen in Germany, however, life expectancy only highlights it further. While the men of the age 80 years or more were only 35% of the population in 2014, their proportion is expected to increase to 41% by 2050. As 60-year-old men observed a rise in an average of 21.5 years to live in 2012-2014 from 12.1 in 1871-1881, the women of 60-year-old on the other hand observed this rise from an average of 25.2 years from 12.7 years respectively (Federal Statistical Office, 2016).

As old age favors more debilitated bodily functions associated with skeletal systems or sensory organs, it has given rise to a new picture of the disease spectrum, which is more age-related, non-communicable, and frequently chronic. This situation puts pressure on the long-term care services due to high demand and also affects health care structures and social security systems (Robert Koch-Institut, 2017). The co-existence of two or more chronic conditions in one individual is defined as multimorbidity which is common in the elderly population and makes them regular visitors to primary care physicians (Violan et al., 2014).

Approximately 62% of the population 65 years of age or above in Germany are suffering from more than three or more chronic diseases (Breckner et al., 2022). The risk of developing multimorbidity increases with advancing age. It affects 76% of women and 68% of men aged 65-74 years and these figures shifts to 82% women and 74% men in the 75-79 age group (Robert

Koch-Institut, 2017). It not only hampers body functions, increases disability, and heightens mortality (Schäfer et al., 2010) (Williams & Egede, 2016) but also deteriorates the quality of life and adds to the healthcare costs because of increasing utilization (Schäfer et al., 2012) (Schneider et al., 2021) (Lenzi et al., 2016) (France et al., 2012).

General practitioners (GPs) have the most share of older patients with somatic and psychiatric diseases in medical care because they are the first contact person for patients (Stein et al., 2021). The last two decades have seen an increase in the multimorbidity prevalence (Uijen & van de Lisdonk, 2008) and research has shown that the multimorbidity follows a pattern. A systematic review has found three pattern combinations cardiovascular and metabolic disorders, mental health issues and the third is musculoskeletal diseases (Prados-Torres et al., 2014). Another systematic review has found a consistent association between age, female gender, lower socioeconomic status, and mental health issues as well. However, the most common combination included osteoarthritis and cardiometabolic disorders like obesity, high blood pressure, ischemic heart disease, and diabetes (Violan et al., 2014). The pattern of multimorbidity has found to be higher in females than males (Williams & Egede, 2016) (Violan et al., 2014) (Uijen & van de Lisdonk, 2008) (Fortin et al., 2005) (Schäfer et al., 2012) (Schäfer, Kaduszkiewicz, Nguyen, et al., 2018).

With increasing number of medical conditions in one patient (France et al., 2012), the multimorbid patients are accounting for most of the consultations in the primary care settings (Luijks et al., 2012). This increases the workload of the GPs, particularly for the chronically ill patient who are a frequent visitors to the primary care centers (Luppa et al., 2020) (Vedsted & Christensen, 2005) (Welzel et al., 2017). The practitioners find it difficult to devote the amount of consultation time required by the patients due to overloaded patients which can lead to opting for suboptimal approaches for the treatment of multimorbid patients (Smith et al., 2010) (Bower et al., 2011) (Marx et al., 2009) (Senft et al., 2021). A study summarized the major challenges that GPs face under four categories: Disorganization and fragmentation of healthcare, inadequacy of guidelines and evidence-based medicines, challenges in delivering patient-centered care, and challenges in shared-decision making (Sinnott et al., 2013)

GPs' perception plays a pivotal role in patients' diagnosis and treatment nevertheless, it often leads to under- or overdiagnosis of certain medical conditions when the physician has a bias towards any gender. Certain studies from Australia (Turnbull et al., 2011), USA and UK (Crilly et al., 2007), and Northern Germany (Marx et al., 2022) have reported such bias with evidence which makes it essential to look for the possibility of similar bias in the treatment provided by the GPs to their patients suffering from multimorbidity.

2. Theoretical Background

2.1 Demographical picture

The first estimate of the population of Germany at the end of the year 2022 is 84.3 million with 42.8 million women and 41.5 million men (DESTATIS Statistisches Bundesamt, 2023). It has been found that there has been a constant dwindling of this population since 2003 and this demographic change is explained by low birth rates and a declining population size of younger people. In contrast to other industrial countries, Germany is more affected by its demography because of increased life expectancy leading to aging of the population and a growing migrant population (Bundesministrium des Innern, 2011). There has been a strong growth of 1.1 million inhabitants in Germany by the end of 2022 as compared to 2021 which is accounted for by the net migration (DESTATIS Statistisches Bundesamt, 2023).

Germany reached its peak population in the mid-1960s, also known as "baby boom", after which it has maintained a low fertility rate, which is currently of 1.6 births per woman. The same "baby boom" population is in their retirement age now, changing the demographic picture of the country. It is expected that 29% of the total population will constitute persons aged 65 or more in 2030 and in 2060, every third person will be at least 65 years which will be accounted for 34% of the total population. As the older population is increasing, the size of the working population is also declining in sixteen years (Bundesministrium des Innern, 2011). This has given rise to a prominent shift in the spectrum of diseases where, more age-related, non-communicable and frequent chronic diseases are seen. In old-age population on one hand where age-related impairments in daily life care are improving, on the other hand, non-severe impairments are on the rise (Robert Koch-Institut, 2017).

2.2 Aging population

Old age brings with it various functional impairments related to sensory organs, muscles, and joints. Senses like hearing and sight loses their sharpness and due to the decrease in muscle mass and strength, endurance and performance of the body deteriorates with advancing age. While many patients get used to living with their chronic conditions, if effective treatments are available, some on the other hand, experience their loss of physical functions as far more burdening than their

diseases. Hence, it is crucial to maintain a person's physical and cognitive functions in old age so that their autonomy and participation in everyday life is assured (Robert Koch-Institut, 2017).

The aging population is on the rise globally, where many countries have over 20% of their population are super-aged societies, that is, older than 65years. Women constitutes the majority of older population which is constantly on the rise with advancing age (Rochon et al., 2021) (United Nations, Department of Economic and Social Affairs, Population Division, 2017). The high rise in older and elderly population elevates the demand on the long-term care services, in turn, impacting the health care structures and social security systems as well. The kind of long-term care received by the people depends on their age (Robert Koch-Institut, 2017).

Germany estimates about 4.5 million people who are in permanent need of long-term care whereas, in 2013, about 2.6 million were in such need. 56% of those in need of long-term care are care level 1, 32% care level 2 and 12% need care level 3. It is not only family and friends who provide the care work, but also the healthcare providers at the outpatient or inpatient nursing services. Women rely on their long-term care insurance more with regards to care in older ages, because of the fact that women live alone more than men (Robert Koch-Institut, 2017).

Germany also shares this imbalance of sex in older population. While the men of the age 80 years or more were only 35% of the population in 2014, their proportion is expected to increase to 41% by 2050. Life expectancy also plays a role in pronouncing the gender difference. As 60-year-old men observed a rise in an average of 21.5 years to live in 2012-2014 from 12.1 in 1871-1881, the women of 60-year-old on the other hand observed this rise from an average of 25.2 years from 12.7 years respectively (Federal Statistical Office, 2016).

One of the plausible consequences of ageing society is increasing number of patients suffering from dementia in coming decades burdening not only the society but the patient and their families as well. There is a drop in the number of new dementia cases in other countries and Germany accounts for 1.4 million dementia sufferers in 2012. However, the number of new detected dementia cases and incidence rates for dementia are seen to have more in women than men, due to more women at the old age than men. The trend of dementia cases is rare under 65 years of age,

nevertheless, they sharply increase from age 75 onwards. By the year 2050, the number of dementia patients are estimated to rise to 2-3 million depending on the success rate of prevention and evolution of the incidence rate in Germany (Robert Koch-Institut, 2017).

2.3 Non-Communicable diseases in older population

As the life expectancy is increasing in Germany, people stay active and healthier longer as they age, it is also contributed due to the medical advancement (Bundesministrium des Innern, 2011). However, older people have reported the increase in impairment of their health as they advance in their age. 18% of the people between the age group of 65 to 69 reported to be suffering from illness or an injury which turned up to 21% for the 70-74 years age group and eventually 28% for those aged 75 and more (Federal Statistical Office, 2016).

There is a huge impact of a small number of diseases and preventable risk factors across all age groups. Germany's biggest proportion of overall burden of diseases is constituted by four groups of non-communicable diseases namely: cardiovascular diseases, musculoskeletal diseases, diabetes, and cancer. The World Health Organization defines these diseases as a central field of action with its Action Plan for Implementation of the European Strategy for the Prevention and Control of Non-communicable Diseases 2012-2016. Since these diseases are a result of inappropriate lifestyles like lack of exercise and unhealthy diet and factors like tobacco and alcohol, these are considered to be preventable. One such example is the significant increase in the burden of disease by sharp increase in obesity which is a consequence of lack of exercise and inappropriate diet (Robert Koch-Institut, 2017).

Excess weight gain has been a constant trend in Germany where in contrast to young adults, 50% of the older population is affected by it. A general trend observed in men in the 65+ age group is that 70% of men, in contrast to 57% of women, have their BMI over 25, which means that their body weight is much higher about their height. Across all age groups, men were more frequently overweight than women however, in older population, where 74% of the men between the age 65-69 years were the sufferers, 59% of the women between the 70-74 were also seen to be overweight. Similar trend is found for smoking, where 12% men are smokers in comparison to 7% women across the age of 65 years and more. (Federal Statistical Office, 2016).

The spread of a chronic metabolic disease, diabetes, is a matter of concern as it affects nearly one in ten adults. Its incidence rates have been increasing consistently since the 1990s, of which one-third is attributed to demographic aging, and some of it is a result of improved screening resulting in a decrease in the number of unrecognized cases. 7% of 18-79-year-olds are diabetes-diagnosed and an additional 2% of this age group are unaware if of their diabetes status. The effectiveness of diabetes type 1 and type 2 management programs and the implementation of the German National Disease Management Guidelines for Type 2 Diabetes have resulted in decrease in the cases of diabetes-related complications like blindness and amputation (Robert Koch-Institut, 2017).

Sinking infectious disease incidence rates and improved therapies have not only increased life expectancy significantly up but also highlighted the importance of chronic diseases in Germany. The demographic aging of this country plays a decisive role in the risk of all types of cancer as the risk increases with increasing age (Robert Koch-Institut, 2017). According to the German Centre for Cancer Registry Data 2011-2012 (Zentrum für Krebsregisterdaten, ZfKD) estimates, approximately 478,000 new cancer cases were diagnosed in 2012, out of which, 252,100 were men and 225,900 were in women, approximately in Germany. The decade of 2002-2012 has seen a rise in new cancer cases by around 13% in men and by 10% in women (Robert Koch-Institut, 2016). In 2013, around 102,000 women and 122,000 men died of cancer, making it the second leading cause of death in Germany after cardiovascular disorders. Since the mid-1990s, mortality rates for most of the cancers have seen a significant decline, taking into consideration the population age structure, except lung cancer incidence in women. This exception was due to the constant increase in female smokers since around 1980 up to the year 2000. The effect of age standardization shows that the last decade has seen a consistency in the male cancer incidence rate. However, cancer rates in women have increased owing to breast cancer primarily. A large number of tumors were detected in the early stages during mammography screening (x-ray examination of breasts) which accounts for increase in the incidence rates. Germany initiated its National Cancer Plan in 2008 underlying the Cancer Screening and Cancer Registries Act (Krebsfrüherkennungs- und registergesetz, KFRG). This act was adopted in April 2013 and laid the foundations to upgrade care for cancer patients and further expand the existing early detection programs (Robert Koch-Institut, 2017).

Musculoskeletal diseases like arthrosis, osteoporosis, and rheumatoid arthritis are the most frequent and common chronic diseases entailing the highest costs. It adds to a prominent burden on the patients and their families because it majorly restricts the physical potential and movements of the basic daily activities. Consequently, these are not only the single largest cause of absence of work and the second most common reason of health-related early retirement, but also the most common diagnosis in preventive care and rehabilitation centers. 25% of women and 17% of men in Germany are suffering from chronic back pain, which already affects the working population at younger ages. A large proportion of the older and elderly population are affected by one or more musculoskeletal diseases. These are also the major cause of chronic pain, physical impairment and loss of quality of life (Robert Koch-Institut, 2017).

A rise in the number of people diagnosed with mental stress and disorders and undergoing treatment is acknowledged since more attention is being paid to such conditions, however, Germany's available data says otherwise. Mental stress and disorders are the most common cause of sick leave and early retirement for 20 years. Although there has been a reduction in the overall early retirement rates an increment has been found in the cases of early retirement due to mental stress and disorders like anxiety disorders, depression, sleep disorders, and alcoholism (Robert Koch-Institut, 2017).

Depression and depressive symptoms have particularly gained importance in the last few years because they are commonly found accompanied with other mental disorders, physical illnesses, chronic stress, and life-changing events. Between 2000 and 2013, number of people retiring due to such disorders was more than double and women were found to be affected by such disorders more than men, irrespective of their social status. In the 18-64 age group, 13% of women and 6% of men reported depressive disorders in the year 2016, where the striking difference is shown in the age group of 30–64-year-olds. In low social status, 16% of women suffer from depressive symptoms in contrast to 11% of men. However, this figure drops to 10% and 5% for women medium and high social status as compared to only 4% for men in high social status category. Chronic stress is also reported by 14% of women and 8% of men (Robert Koch-Institut, 2017).

2.4 Primary Health Care

According to the World Health Organization & Fund (UNICEF), 2018, primary health care is "a whole-of-society approach to health that aims at ensuring the best feasible degree of fitness and wellbeing and their equitable distribution via way of means of specializing in people's desires as early as feasible alongside the continuum from health promotion and disease prevention to treatment, rehabilitation, and palliative care, and as close as feasible to people's everyday lives." It is considered as the foundation of the health systems which caters to a large part of health needs of patients during their life course (Kuehne et al., 2022).

To strengthen primary care, Germany has implemented health system reforms in the law (Social Code Book V) during the beginning of the 21st century. These were outlined as voluntary arrangements between healthcare insurers and GPs and patients' voluntary enrollment (Hausarztzentrierte Versorgung). The augmentation of chronically ill patients' intensive management, participation of GPs, and coordination of access to medical specialist care have proved the effectiveness of these health system reforms. Some of the studies have reported that on one hand, these programs have multiplied the primary care usage by the patients, and on the other hand, they have lowered the number of hospital admissions and healthcare costs (Wensing et al., 2019).

It is one of the major challenges for healthcare systems to establish a successful structure that provides better diagnosis, treatment, and prevention of chronic diseases. To improve its effectiveness and efficiency, Disease Management Programs (DMP) were established as statutory treatment programs in the outpatient sector keeping primary care in mind, in 2002 in Germany (Wangler & Jansky, 2021).

In 2005, Germany participated in a project study funded by the Commonwealth Fund to determine the quality of care from various aspects and primary care physicians were surveyed in 2006 under the same study. According to the results, German GPs reported the greatest number of patient contacts along with the shortest period of contact in comparison to the other participant countries of the study which were, Australia, Canada, New Zealand, the United States, and the United Kingdom. Concurrently, the German physicians also conveyed the highest level of dissatisfaction

with their healthcare system amongst all (Ärzteblatt, 2011). Germany reports more emergencies in primary care offices than any other country internationally. Although the GPs are prepared for emergency dealing but sometimes face insecurity which depends on the nature of the emergency against their qualifications (Melzel et al., 2022).

Evidence-based healthcare for chronic conditions is not advancing in most healthcare systems despite the significant advancement regarding prevention, diagnosis, monitoring, and treatment of chronic diseases. The evidence-based policy response to such practice gap was the development of the Chronic Care Model (CCM). It uses a multi-faceted strategy which covers various factors like: the continuous relationships of patients with their care team; individualization of care according to the patient's needs; and services based on scientific evidences and cooperation among clinicians (Bulgaru-Iliescu et al., 2013). The chronic care model by Wagner et al. implies that good outcome and high-quality patient care can be associated as a result of the connection between practice team and patients that provide persistent assessments, aid in self-management, optimization therapy and follow-up (Breckner et al., 2022).

Its approach states that the effectiveness of health care utilization by patients through systemic patient-centered approaches can be increased with the implementation of information technologies at the primary care level. For example, use of information technologies such as electronic medical records and disease registries provides comprehensive medical information not only about the individual patient but the population data as well. Its usage can will not only facilitate the cooperation between healthcare professionals but will broaden the GPs' understanding of patients' medical conditions and therapeutic recommendations, increasing their potential to provide evidence-based services (Bulgaru-Iliescu et al., 2013).

If the safety and effectiveness of care for adults with multimorbidity must be ensured, especially, the focus of health care has to shift to the management of countless individual diseases as this "baby boom" population has declining health and rising health service usage ahead of them. Individual patient's health goals with distinctive sets of risks, priorities and conditions can be maximized if the priority is evolved from disease inclination to patient-centeredness. (Tinetti et al., 2012)

Various studies have demonstrated that limited health literacy skills are one of the reasons for poor adherence to medication regimens, inadequate self-management capabilities and more recurrent hospitalizations and emergency care utilization. This poses more challenge in vulnerable groups like the elderly population to achieve high healthcare quality and equality. If sufficient health literacy skills with regards to the ability of an individual to understand the written information while learning about their medical condition are present, it can be significantly related to the perceived satisfaction with primary care. It signifies that besides provider-related factors in care delivery, sufficient health literacy has an considerable impact on the perception of quality care in terms of healthcare delivery satisfaction in primary care settings (Altin & Stock, 2015).

2.5 General Practitioners and their perspectives in primary health care

In Germany, primary health care is provided by GPs and people can choose their GP by their free will. This country is facing a shortage of GPs like most Western countries especially in rural areas and, GP specialty is not so popular amongst the medical students. According to a survey in 2014, only 8.9% of the medical students opted for GP specialty in contrast to 16.2% for internal medicine and 9.4% for Pediatrics and adolescent medicine. Demographic changes demand even more GPs in future, particularly for elderly population of 65 years or older, which is constantly growing from 16.4% in 2000 to 20.6% by 2010. These elder patients are often found to be suffering from multiple chronic diseases (Reuter-Oppermann et al., 2019).

Medical students in Germany do not opt for GP specialty for various reasons, for example, lack of prestige associated with being a GP as the German health care does not recognize the GP role as the central role (DEGAM 2009). The distribution of physicians for the population is uneven leading to oversupplied and undersupplied physicians, especially in rural areas. This has given rise to a situation of replacing retired physicians and luring young physicians to practice in rural areas. In addition to the unattractiveness of GP specialty amongst undergraduate medical students, they have little to no practical experience with rural medical care during their education as their medical studies are completed in German cities usually (Kuhn et al., 2017).

In terms of medical care, GPs have the highest share of older patients with somatic and psychiatric diseases, they are the first contact person. The most common physical ailments in people over 70 years of age are cardiovascular and musculoskeletal disease, with regards to somatic diseases while on the other hand, the most common psychiatric ailments are dementia and depression in older age population (Stein et al., 2021).

2.6 Multimorbidity and its management

Multimorbidity is defined as the co-existence of two or more chronic conditions in one individual. It is a common issue among the elderly population and they are regular visitors to primary care physicians (Violan et al., 2014). The risk of contracting two or more chronic conditions (multimorbidity) increases with age. It affects 76% of women and 68% of men aged 65-74 years and these figures shift to 82% women and 74% men in the 75-79 age group (Robert Koch-Institut, 2017).

In Germany, about 62% of patients of the aged 65 years or above are suffering from more than three or more chronic diseases (Breckner et al., 2022). In general practices, the prevalence of morbidity in patients ≥60 years is around 85% (Tomandl et al., 2021). Multimorbidity corresponds to a reduction in the body functionality, increase in disability, and higher mortality (Schäfer et al., 2010) (Williams & Egede, 2016), as well as poor quality of life, rising healthcare costs because of an increase in utilization (Schäfer et al., 2012) (Schneider et al., 2021) (Lenzi et al., 2016) (France et al., 2012).

The prevalence of multimorbidity in primary care has increased over two decades (Uijen & van de Lisdonk, 2008) and research has shown that the multimorbidity pattern can be divided into 1) Anxiety, depression, somatoform disorders and pain, and 2) cardiovascular and metabolic disorders. It has been found in a study that female multimorbid patients fell into the former category as opposed to male multimorbid patients who tended more towards cardiovascular and metabolic diseases (Schäfer et al., 2012) (Schäfer, Kaduszkiewicz, Nguyen, et al., 2018). The pattern of multimorbidity has been found to be higher in females than males (Williams & Egede, 2016) (Violan et al., 2014) (Uijen & van de Lisdonk, 2008) (Fortin et al., 2005).

Out of all the consultations by a GP, 80% are concerned with multimorbidity however, this is generalized in geriatric patients. The presence of multimorbidity makes the management of patients a real challenge for physicians in many ways. Firstly, while diagnosis and monitoring, it is essential to take into consideration the probable complex interlinked pathophysiological pathways underlying the conditions. Secondly, the possible risks and benefits need to be considered while developing care plans for each condition and across diseases. Moreover, although some concurrent conditions may not have a clinical consequence but, they may complicate the presentation of symptoms. All of these collectively reduce the certainty of outcome and complicate the process. (Muth et al., 2019).

The management of multimorbid patients raises challenges to healthcare providers as although the patients with multimorbidity have higher hospitalization rates and overall higher healthcare costs, those patients still do not receive good quality care concerning single diseased patients (Sinnott et al., 2013). Moreover, there was a lack of valid measures for the quality of care for patients with multimorbidity which is developed by a study recently. This study validated nine care quality dimensions, including core sets of twelve GP-reported and seven-patient reported including core sets of twelve GP-reported and seven-patient reported quality indicator set (Schäfer et al., 2023). There is a leading German treatment guideline (DEGAM, 2017) for multimorbidity emphasizing care processes and decisions regarding treatment of multimorbid patients in primary care. The objective is to improve their quality of life and functional abilities and reinforce self-management strategies. However, it obliviates specific diseases due to the diversification of the patient population (Seibert et al., 2022).

2.7 Challenges faced by primary care physicians with regards to multimorbidity

As the number of medical conditions in one patient is on the rise (France et al., 2012), the hospital admission rates, and healthcare expenditure has also increased by manifolds. Hence, in the primary care setup, the patients with multimorbidity are accounting for most of the consultations with the situation of intercurrent morbidity. It causes GPs to have predominantly “additional patient” visits than patients with single disease (Luijks et al., 2012).

There is an increase in the visitation to the GPs in Germany which has escalated their workload, especially for chronically ill-patients whose visitation is more frequent. Hence, they are termed as frequent attenders which means, they attend GPs regularly and exceed a certain number of visits within a given period. Studies (Luppa et al., 2020) (Vedsted & Christensen, 2005) (Welzel et al., 2017) have explored that there is a positive relationship between the severity of physical disorders, multimorbidity, and frequent attendance. (Van den Bussche et al. 2016) analyzed claims data for a German statutory health insurance company which reported 27 chronic conditions in people ≥65 years that doubled the risk of being frequent attenders. The associated chronic illnesses, in particular, are osteoarthritis, rheumatoid arthritis, other musculoskeletal disorders, respiratory diseases, back pain, and migraine (Luppa et al., 2020).

GP is not the lone prescriber of a multimorbidity patient, but most patients have a long-standing relationship with them (Anthierens et al., 2010). Their primary focus is the patient's quality of life which is a struggle to deal with (Luijks et al., 2012). A study has highlighted the major challenges that GPs face under four categories: Disorganization and fragmentation of healthcare, the inadequacy of guidelines and evidence-based medicines, challenges in delivering patient-centered care, and challenges in shared-decision making (Sinnott et al., 2013).

2.7.1 Disorganization and Fragmentation of Healthcare

A patient with multimorbidity needs more than the usual consultation time with their general practitioner due to the complexity of their condition at the primary care center. Unfortunately, GPs find it very difficult to spend the required amount of time with these patients because of the usual overload of patients. Insufficient consultation time often compromises the response towards the needs of a multimorbid patient and GPs end up opting for suboptimal approaches for the treatment (Smith et al., 2010) (Bower et al., 2011) (Marx et al., 2009) (Senft et al., 2021) (Boyd et al., 2005).

In Germany, a critical situation with regard to time constraints in primary care has been suggested by various studies. The International Survey of the Commonwealth Fund showed that the proportion of time spent by German GPs was higher than the other participating countries. Furthermore, 45% of the physicians were dissatisfied with the time spent per patient. The average

consultation time for Germany was 7.6 min which was the lowest out of all the participating countries (von dem Knesebeck et al., 2019).

Fragmentation of healthcare is developed from the poor communication between the different medical specialties, hospitals, and GPs. Each specialty emphasizes their guidelines and it is suggested that they are inconsiderate wider harms and benefits of organ-specific intervention which worsens the multimorbid situation (Sinnott et al., 2013). Older adults are the major consumers of polypharmacy because of their multimorbidity which makes it difficult for their GPs to maintain a record of their medications, also taking into consideration the possibility of self- medication by these patients (Anthierens et al., 2010).

2.7.2 Inadequacy of Guidelines and Evidence-Based Medicines

Multimorbidity in primary care is not an exception anymore, rather it is becoming predictable nowadays but it lacks evidence-based interventions (France et al., 2012). Different medical conditions have laid down their prescribing guidelines which are specific to that condition only (Solomon et al., 2012). Majority of the clinical practice guidelines do not provide room for their application for older people with multiple comorbidities. They do not reflect upon burden, short- and long-term goals, the quality of underlying evidence, or any guidance of inculcating patient preferences in the treatment plan (Boyd et al., 2005). Patients are seen by multiple specialists in different institutions, and organizations, which slices the healthcare into different segments (Haggerty et al., 2003).

As the number of healthcare providers in the treatment of a multimorbid patient increases, it complicates the process of sharing and synchronizing information with regards to diagnostic or therapeutic decisions (Seibert et al., 2022). This arrangement has made the management of a multimorbid patient more complex than helpful. GPs believe these guidelines do not have enough evidence to justify and hence they are not comfortable extrapolating them onto their multimorbid patients. Sometimes physicians modify their approach for their patients but that only leads to conflict with the “best practice” and a pang of moral guilt as well (Sinnott et al., 2013).

2.7.3 Challenges in Delivering Patient-Centered Care and Shared-Decision Making

The preference of a physician is always the function and quality of life provided to the patients rather than focusing on disease-specific outcome measures (Sinnott et al., 2013). Patient-centered care for multimorbid populations demands adequate time for communication and decision-making and abundant communicative-skills of healthcare providers and patients as well (Seibert et al., 2022). In case of multimorbidity, patient-centered care is overlapped with its multiple medical focuses which enhances the complexity of care for the physician. The GPs always can have an additional conflict with specialist services or evidence-based medicine. This conflict is multiplied by certain problems at the end of the patients, for example, the cognitive or memory affections, insufficient financial and social support, and lower levels of motivation. These are likely to affect not only the comprehension of the patients but also their ability to adhere to the treatment (Sinnott et al., 2013).

GPs already have a huge list of challenges to face but what adds to it is, the patient preference, especially in a patient with multimorbidity. On one hand, are patients who actively prioritize and participate in the decision-making process and sometimes consent to do trial and error, while on the other hand are certain patients, who add to the difficulties of their GP. These patients are not confident of their choices and consider it as rather a source of distress which makes them overanxious of their condition. GPs found involving patients particularly troublesome to discuss the risks and outcomes related to treatment options or to discuss the balance between quality and quantity of life (Sinnott et al., 2013).

2.8. Polypharmacy

A regular use of ≥5 medications is considered polypharmacy, is found to be increasing in recent years in older adults, ranging from about 26 to 40% in Europe in patients with polypharmacy evidence has shown a higher risk of inappropriate medication use which is associated with unfavorable results including increased risk for falls, decreased functional ability, cognitive capabilities, and nutritional status, also, poor treatment adherence and impaired quality of life. This prevalence of inappropriate medication is more in older adults globally due to the changes in age and rising vulnerability and risks of drug side effects (Lüthold et al., 2022) (Boyd et al., 2005).

Multimorbidity is layered by the multiple medicines that the patient must take. Polypharmacy escalates the probability of interactions between diseases which makes the medication choice complex for the physician. Furthermore, additional prescriptions need to be made to counteract the side effects of the prescriptions (Muth et al., 2019). For example, a study showed that due to polypharmacy, many older multimorbid patients are exposed to anticholinergic drugs or drugs with such activity. This study demonstrated the association of decreased cognitive function determined by the Letter Digit Substitution Test (LDST) which is the risk of anticholinergic adverse reactions (Krüger et al., 2021).

There is widespread harm originating from polypharmacy which poses the greatest risks to older population. In contrast to younger adults, older adults have a lower clearance rate for drugs which leads to high concentration of drugs in their bodies. Unfortunately, older women are more susceptible to this harm than older men because of their pharmacokinetic and pharmacodynamic changes. The prescription differ between the two genders often, for example, women are prescribed for the management of conditions like migraine, depression, sleeping problems, and thyroid disorders while on the other hand, men's prescriptions are more likely for secondary prevention therapy, particularly heart conditions (Rochon et al., 2021). Patients are also equally concerned about the medication that has been prescribed to them but the hurdle with these patients is constant adherence to their medication schedule (Mahler et al., 2012).

2.9. Gender aspects in health care

Sex and Gender are the terms that are often used interchangeably but they are not the same. The biological traits of men, females, and intersex individuals, such as chromosomes, hormones, and reproductive organs, are what the World Health Organization refers to as "sex" (Gender and Health, n.d.). It refers to the biological and physical attributes that differentiate humans as males or females but these sets of biological features are not mutually exclusive because some of the individuals possess both (*Sex and Gender - Gender Matters - Council of Europe*, n.d.) (Clayton & Tannenbaum, 2016).

However, "gender" is defined by the World Health Organization as the socially constructed characteristics of women, men, girls, and boys, including norms, behaviors, and roles associated

with them respectively and their relationships with each other. Gender being a social construct, is hierarchical and varies from society to society, and changes over the time. (*Gender and Health*, n.d.) (Clayton & Tannenbaum, 2016).

Although gender and sex are related, but they differ with gender identity. Gender identity is an individual's deeply felt internal experience of gender, irrespective of their physiology or the sex by which they were identified at the time of their birth. Gender influences the access to healthcare in the manner of the availability and organization of health services, health information. Health services should be affordable, accessible, and acceptable with quality, equity, and dignity yet, gender inequality and discrimination are faced by women and girls, putting their health and well-being at risk. Mobility restrictions, lack of access to decision-making authority, low literacy rates, discriminatory attitudes in communities and among healthcare providers, and a lack of knowledge about the unique health needs and challenges faced by women and girls among healthcare providers and health systems are just a few of the obstacles they face. This discrimination based on gender traverses with other discriminatory factors such as ethnicity, socioeconomic status, disability, age, geographic location, gender identity, and sexual orientation (*Gender and Health*, n.d.).

This discrimination based on gender has led to differences in the treatment of various medical conditions provided to patients in different parts of the world. An example is that of heart failure in northern Germany. Heart Failure (HF) prevalence increases with advancing age and a major proportion of the affected people are at least 75 years old (Marx et al., 2022). Men seem to have affected by it more in the population of age more than 60 years old, however, women are affected more in the population less than 60 years of age (Koens et al., 2020). Its uncertain signs and symptoms are often misinterpreted and go unnoticed and untreated especially in older patients as they are considered as normal aging symptoms. Although the presentation of HF is similar in both gender, physicians are found to overlook affected women and misinterpret those symptoms as that of asthma or Chronic Obstructive Pulmonary Disease (COPD). Female patients often face delays in diagnosis and treatment due to the physicians' perception of HF as "man's syndrome" and their possible oblivious understanding of gender-related issues. In former analysis, GPs concentrated more on the lifestyle of men than women during patient's medical history (Marx et al., 2022).

Similar gender discrepancies has been brought into light by this study (Crilly et al., 2007) concerning diagnosis and treatment care in UK and USA for patients of chronic heart diseases (CHD). Women are, specifically, at risk of receiving sub-optimal care when they are showing the symptoms of angina in a hospital setting. This study highlighted the contrast in providing cardiac care to women with "clinically certain angina" as opposed to men. Women received significantly less attention in recording their cardiac risk factors, receiving secondary prevention therapy, undergoing revascularization, or referring for further cardiac investigations. Furthermore, these gender differences were relevant after calibrating them for older women with angina, their lower prevalence of a prior Myocardial Infarction (MI), longer duration of angina, and older age at diagnosis (Crilly et al., 2007).

This prejudice is also seen in Australia where 34% of all deaths were contributed by cardiovascular diseases in 2009. Despite the continued rise in death rates of women by coronary heart disease and decreasing rates for men, cardiovascular disease was still considered a "male problem" by healthcare providers. The necessary investigations and evidence-based therapies were not provided to the female patients due to underestimation of the risk probabilities carried by them (Turnbull et al., 2011).

GPs are the first contact point for the patients and hence the perception of the physician plays a fundamental role in patients' diagnosis and treatment. However, their biasedness towards any gender can lead to over- or underdiagnosis of a certain condition (Marx et al., 2009). In certain studies, multimorbidity has shown higher gender differences with prevalence affinity for women more than men (van den Bussche et al., 2011) (Marengoni et al., 2008).

2.10 Research Question and Hypothesis

To the best of my knowledge, no other study has so far explored the existence of gender bias in the treatment of multimorbid patients. Taking into consideration the above-mentioned knowledge about the physicians' perception concerning the diagnosis and treatment of patients based on their gender, this study aims to explore if this bias is practiced by GPs in the treatment of multimorbid patients as well. We state our Hypothesis as:

Null Hypothesis: H_0 – Gender of a multimorbid patient does not affect the treatment provided by their general practitioners.

Alternative Hypothesis: H_1 – Gender of a multimorbid patient does affect the treatment provided by their general practitioners.

3. The bigger picture: Project MultiTool

Multimorbidity is a complex condition because the symptoms may be from one of the diagnosed diseases or from a health problem that has not yet been diagnosed but could be dangerous to the patient. Its treatment is equally challenging as medicines that provide benefit for one disease may be harmful for another, and sometimes so many treatments are needed that they are almost impossible to carry out. When the patient visits the physician with new or worsening symptoms, the treatment decision is difficult to carry out hence, the doctor and patient must work together to determine which treatments are important and which are not. The project, MultiTool aims to support general practitioners and patients with multimorbidity in this decision.

The main innovation of the intervention by the project is a computerized tool. A systematic review (Riaño & Ortega, 2017) categorized computerized tools to support the management of multimorbidity as knowledge integration, treatment integration, and data integration. Knowledge integration approaches combined knowledge about the management of individual diseases to suggest treatment plans for multiple diseases. Treatment integration approaches structure planned treatments and evaluate given treatments based on evidence about disease-treatment interactions. Data integration approaches possible individualized treatment plans based on machine learning using data on multimorbidity treatment experience (Riaño & Ortega, 2017). Data integration would require huge datasets to capture the impact of multimorbidity, as there is a myriad of specific interactions between diseases, drugs, and medicines that would need to be considered. Therefore, knowledge and treatment integration approaches will be implemented, but not data integration approaches. In addition to the computerized approach, other innovative aspects of the intervention also relate to the incorporation of tools for documenting information and locating current knowledge.

To ensure the patient-centeredness of the intervention, the assessment of patient preferences will be based on the dimensions of survival, maintenance of independence, pain relief, treatment load, and reduction of other symptoms. Furthermore, contextual information is captured, including family support, logistical challenges, and financial constraints, which have been identified as important barriers and facilitators to managing multimorbidity. Thus, the key element of the

intervention consists of documentation of patient information, and evidence-based and patient-centered care.

The modus operandi of the project follows:
The first step is where a computer program is developed which:

- helps the physician to gather information about the patient and their health problems, social situation, and life goals.
- guides the GPs in assessing symptoms, and
- helps the GPs and patient in making a treatment decision based on the latest medical evidence and considering the patient's preferences.

Secondly, a cluster-randomized controlled trial will be designed to evaluate the program in a scientifically sound manner. In this study, patients from practices where the tool will be used will be compared with the same number of patients receiving treatment as usual with the help of a computer program.

In the final stages, a sample of 620 patients from 62 practices is expected which will be used to examine whether patients benefit when their physician uses this program or not. Health benefits will be measured by the amount of time patients have to spend in the hospital. Throughout the project, patients and physicians will be involved in the development of the intervention and the study, as well as in the interpretation of the study results.

4. Methods and Methodology

4.1 Study design and settings

This is a cross-sectional observational study based on standardized telephone interviews conducted with patients. About 20 GPs from different rural and urban administration districts in a 100km radius around Hamburg, Schleswig-Holstein and Niedersachsen were recruited for the participation in a pilot randomized controlled study. The rationale for including both, rural and urban regions is that there were differences found between these regions for (Schäfer et al., 2020):

- the reasons as to why the consultation of the physician is needed,
- the healthcare services provided,
- the workload of primary care physicians and
- the GPs' ability to spend the additional time needed for the implementation of our intervention (Schäfer et al., 2020).

4.2 Information about the target group

The inclusion criteria for the patients were if they are of the age 65 years or older. They were allowed to participate in the study if they have been enrolled in Disease Management Programs (DMPs) and suffered from multimorbidity – defined as the presence of at least three chronic conditions from a list of 42 diagnosis groups (Schäfer, Kaduszkiewicz, Mellert, et al., 2018). These programs are designed for the long-term management of chronic nature of diseases like breast cancer, diabetes, and coronary heart disease. They include treatment which is coordinated by the GPs with a focus on patient education and self-management with the regular consultations (Schäfer et al., 2023).

Patients were excluded if they were unable to participate in telephonic interviews or the intervention because of any kind of functional disability that like, hearing, speaking, or cognition. They could not take part in the study if their German language skills were limited. Another criterion for exclusion was functional limitations like vision or intellectual disability. The lack of capacity to consent like in Dementia was also another exclusion criteria. Patients who were participating in another scientific study within the anticipated time frame of our study were also excluded, as were those who did not own or could not use an internet-enabled gadget.

GPs were eligible to participate in the study if they were accredited as statutory health insurance physicians in their administrative area and could compile a list of all the patients they had treated during the previous quarter (a three-month accounting period) using an EDP system.

4.3. Recruitment of the target group

Participant GPs each recruited 6 patients on average for the study. The selected patients were chosen according to a protocol.

The first step was to print a list of all the patients who met the inclusion criteria. From this list, if possible, 20 patients were randomly selected using an online random number generator. All the selected patients were contacted by mail using a standardized letter. The letter will be signed personally by the GPs. A stamped return envelope was enclosed with the cover letter, using which the patients replied directly to project coordinators.

4.4 Instruments used for data collection and analysis

The standardized questionnaire used for the telephonic interviews included age, sex, and further sociodemographic data including their migration background, living conditions, socioeconomic status and education level. It discussed the information about the physical and mental health of the patient, their treatment plan, and the management of their multimorbidity from the perspective of both, the patient, and their GP. The instrument used is a derivative of European Task Force on Patient Evaluations of General Practice Care (EUROPEP) questionnaire (Dimova et al., 2017) and EQ-5D questionnaire (Marten et al., 2022).

The EUROPEP instrument had 23 items on a Likert scale structuring five qualitative aspects into two sections: clinical behavior and organization of care. These categories measured various aspects like medical care, continuity, and cooperation, information, support and accessibility, and doctor-patient relationship (Dimova et al., 2017). The EQ-5D questionnaire measured the health-related quality of life in two categories; the first one covers the five descriptive elements (mobility, self-care, usual activities, pain or discomfort, and anxiety or depression) and the second one assesses the subjective health of the respondent apart from the descriptive elements through a visual analog

scale (Marten et al., 2022). However, the second category of the visual analog scale was not used for this study.

4.5 Data analysis

The statistical evaluations were carried out with software program STATA 15.1. The statistically significant level for rejecting the null hypothesis was considered as p-value <0.05.

The demographic data was assessed in terms of mean, standard deviation, frequency, and percentage. The EQ-5D questionnaire results are reflected in terms of frequency and percentage as well. The German value set was used to compute an EQ-5D summary score. This set allows a better evaluation of the health-related quality of life-based on individual preferences, facilitating its utilization in various contexts such as healthcare policy cost-utility analysis and clinical evaluations within the German healthcare system. According to Ludwig et al. (2018), it shows a value of 1 000 for full health, which may be lowered by up to five subtrahends, ranging from -0.026 to -0.612, based on how severe the constraints are in each of the five dimensions.

The satisfaction of the patient was measured on the standardized EUROPEP instrument which has 23 items, observing the qualitative aspects of clinical performance (items 1-16) and organization of care (items 17-23). All the 23 items of EUROPEP instrument are assessed in terms of mean and standard deviation for all the genders separately. In addition to descriptive analysis, a multivariate logistic regression analysis was carried out. The final model including variables gender, age and EQ-5D with significant effect estimators, the adjusted-R square was used to associate the results concerning clinical performance and organization of care.

4.6 Ethical approval

This study is a part of the project Multitool which is approved by the Ethics Commission of the Medical Association (Ethik-Kommission der Ärztekammer Hamburg) under the study number 2022-100786-BO-ff. All the patients gave written informed consent to participate in the study.

5. Results

After almost 13 weeks (19.09.2023 – 14.12.2023) of the recruitment process for the intended 120 patients, 64 patients participated in the study. Their sociodemographic data is represented in Table 1. The maximum age of the participating patients is 89 years, and the minimum is 66 years. The mean age of the patients is 75.3 years with women having higher representation (59.4%) than men (40.6%). None of the patients addressed themselves to be of non-binary gender hence, the demography of the data is divided into men and women gender only. The majority of the patients are married (62.5%) and live with their spouse/ partner (61.8%) while only 3.1% are divorced and the least percentage (1.5%) of the patients live with minor children. In terms of education, 56.3% have completed primary school education and most of the patients (48.4%) did company-based vocational training. Migration status data reflects that 65.1% of the patient and parents were born in Germany, 25.3% of patient in Germany with one or both parents abroad, and 9.5% patients were born abroad.

Table 1: Sociodemographic and socioeconomic status of patients

Variable	Frequency	Percentage
Age		
Minimum Age	66	
Maximum Age	89	
Average Age (Mean)	75.3	
Standard Deviation	6.32	
Gender		
Men	26	40.6
Women	38	59.4
Non-binary	--	--
Family Status		
Single	8	12.5
Married	40	62.5
Divorced	2	3.1
Widowed	14	21.9
Living Situation		
Living alone	17	25
Living with spouse/ partner	42	61.8
Living with minor children	1	1.5

Living with adult children	6	8.8
Living with other family members	2	2.9
Highest General School-Leaving Qualification		
Primary school	36	56.3
Secondary school	17	26.6
Technical College Entrance Qualification	5	7.8
Subject-specific University Entrance Qualification	6	9.4
Highest Vocational Training Qualification		
No vocational training	3	4.7
Company-based vocational training	31	48.4
School-based vocational training	6	9.4
Completion of vocational school/ Advanced training	13	20.3
University of Applied Sciences degree	6	9.4
University degree	5	7.8
County of Birth (Patient)		
Germany	58	90.6
Poland	3	4.7
Russia	2	3.1
Eritrea	1	1.6
Migration Status (including country of birth of each parent)		
Patient & parents born in Germany	41	65.1
Patient in Germany, one or both parents born abroad	16	25.4
Patient born abroad	6	9.5
Total	64	100.0

The results of the EQ5D questionnaire (Table 2) reported that 35.9% of the patients do not have problems with flexibility/ mobility or washing/ dressing (89.1%) or their everyday activities (65.6%) and 35.9% of the patients have no pain or physical discomfort and 70.3% have neither anxiety nor depression. Although inability to walk, wash/ dress, or carry out activities of daily living was reported by none of the patients, 1.6% reported of having extreme pain and discomfort, and 4.7% of patients reported having extreme anxiety or depression.

Table 2: Patients' Health Condition measured with EQ5D Questionnaire: Results

EQ5D Questions	Frequency	Percentage
Q1: Flexibility/Mobility		
No problems walking	23	35.9
Slight problems walking	19	29.7
Moderate problems walking	17	26.6
Severe problems walking	5	7.8
Unable to walk	--	--
Q2: Self-care		
No problems washing/ dressing	57	89.1
Slight problems washing/ dressing	6	9.4
Moderate problems washing/ dressing	1	1.6
Severe problems washing/ dressing	--	--
Unable to wash or dress	--	--
Q3: Everyday activities		
No problems with activities of daily living	42	65.6
Slight problems with activities of daily living	11	17.2
Moderate problems with activities of daily living	8	12.5
Severe problems with activities of daily living	3	4.7
Unable to carry out activities of daily living	--	--
Q4: Pain or Physical discomfort		
No pain or discomfort	23	35.9
Slight pain or discomfort	15	23.4
Moderate pain or discomfort	19	29.7
Severe pain or discomfort	6	9.4
Extreme pain or discomfort	1	1.6
Q5: Anxiety or Depression		
No anxiety or depression	45	70.3
A little anxiety or depression	9	14.1
Moderate anxiety or depression	7	10.9
Very anxious or depressed	--	--
Extreme anxiety or depression	3	4.7
Total	64	100.0

The subjective health assessed by the EQ5D instrument, and its results are reflected in the sum scores in Table 3. In this scale the value 0 refers to the poorest health and the value 1 refers to feeling the healthiest. In our results, the minimum value is 0.008 which implies the poor health

status of the patient in the sample. The mean is 0.82 which is closer to the value 1 suggesting that the majority of the patients feel healthier in our sample size.

Table 3: EQ5D sum score results

EQ5D: Sum scores	
Minimum	0.08
Maximum	1
Mean	0.82
Standard Deviation	0.21
Total	64

5.1 Patient Satisfaction

There was no missing data except that one patient did not answer the EUROPEP questions. After conducting two-sample t-test with equal variances on each of the items for males and females, only three items (PEP 6, PEP 21, and PEP 22) reflected statistically significant results (p-value < 0.005) for the test, providing the evidence to reject the null hypothesis, rest all the items did not have any statistically significant result (Table 4).

The p-value is less than the typical significance level of 0.05 for three items out of 23 EUROPEP items. This indicates a statistically significant difference between the means of the men and women groups with respect to EUROPEP item 6 about keeping the confidentiality of their information and records (p-value 0.033, Table 5), EUROPEP item 21 about the possibility to speak to the general practitioner himself on the phone (p-value 0-0374, Table 6) and EUROPEP item 22 about waiting times in the practice (p-value 0.0402, Table7). The negative sign of the difference suggests that the mean of the "men" group is lower than that of the "women" group.

Table 4: PEP6: How care was taken to keep your information and records confidential?

Group	Observations	Mean	Standard deviation	95% confidence interval
Men	26	3.58	0.58	(3.34, 3.81)
Women	37	3.84	0.37	(3.71, 3.96)
Combined	63	3.73	0.48	(3.61, 3.85)
Difference		**-0.26**	0.12	**(-0.50, -0.02)**
Difference = mean (men) – mean (women)			**t = -2.18**	
Ho: diff = 0	Degrees of freedom = 61			
p-value = 0.0333				

Table 5: PEP21: How was it possible to speak to the general practitioner himself on the phone?

Group	Observations	Mean	Standard deviation	95% confidence interval
Men	5	1.6	1.14	(0.18, 3.01)
Women	9	3.1	1.17	(2.21, 4.00)
Combined	14	2.57	1.34	(1.80, 3.35)
Difference		**-1.51**	0.65	**(-2.92, -0.10)**
Difference = mean (men) – mean (women)			**t = -2.34**	
Ho: diff = 0	Degrees of freedom = 61			
p-value = 0.0374				

Table 6: PEP22: How were the waiting times in the practice?

Group	Observations	Mean	Standard deviation	95% confidence interval
Men	26	3.19	0.75	(2.89, 3.49)
Women	37	2.73	0.93	(2.42, 3.04)
Combined	63	2.92	0.89	(2.70, 3.14)
Difference		**0.46**	0.22	**(0.02, 0.90)**
Difference = mean (men) – mean (women)			**t = 2.10**	
Ho: diff = 0	Degrees of freedom = 61			
p-value = 0.0402				

5.2 Regression Models

Table 7: Association of patient satisfaction with respect to clinical performance with gender, age, and EQ5D: Results from multivariable linear regression (n=63)

Group	Independent variable	R^2	Adjusted R^2	Coefficient (b)	p-value	95% Confidence Interval
Clinical performance	Gender	0.048	-0.0004	0.152	0.383	(-0.19, 0.50)
	Age			0.0078	0.553	(-0.18, 0.04)
	EQ_value_d			0.6081	0.127	(-0.18, 1.40)
Model					0.4033	

In the regression model (Table 8), the R-squared is 0.0480 which is low, indicating that the model explains a small portion of the variability in patient satisfaction with clinical performance. Adjusted R-squared is -0.0004, which suggests that the adjusted model does not perform better than the unadjusted model and does not improve the fit of the model, The F-statistic's corresponding p-value is 0.4033, which is greater than the significance level of 0.05 indicating that the overall model may not be statistically significant.

The individual p-values for each variable indicate whether each variable is statistically significant, and in this case, none of the variables (Gender 0.383, Age 0.553, EQ_value_d 0.127) reach the significance level ($p<0.05$), hence, the regression analysis overall, suggests that the combination of gender, age, and EQ_value_d may not be statistically significant in predicting patient satisfaction for clinical performance.

Table 8: Association of patient satisfaction with respect to organization of care with gender, age, and EQ5D: Results from multivariable linear regression (n=63)

Group	Independent variable	R^2	Adjusted R^2	Coefficient (b)	p-value	95% Confidence Interval
Organization of care	Gender	0.076	0.029	-0.036	0.848	(-0.42, 0.34)
	Age			0.0049	0.735	(-0.02, 0.34)
	EQ_value_d			0.864	**0.049**	**(0.00, 1.73)**
Model					0.198	

In the regression model (Table 9), R-squared is 0.0755 which is low, indicating that the model explains a small portion of the variability in patient satisfaction for organization of care. Adjusted R-squared is 0.0285, which suggests that the adjusted model does not perform better than the unadjusted model and does not improve the fit of the model. The p-value associated with the F-statistic is 0.1978, which is greater than the significance level of 0.05 indicating that the overall model may not be statistically significant.

The individual p-values for each variable indicate whether each variable is statistically significant, and in this case, most of the variables (Gender 0.848, Age 0.735) do not reach the significance level ($p < 0.05$) however, the p-value of EQ_value_d is 0.049 which is lower than the significant level of 0.05. This suggest that the combination of gender and age may not be statistically significant in predicting patient satisfaction for organization of care but EQ_value_d may have some association with patient satisfaction for organization of care.

6. Discussion

The aim of this study was to investigate whether the gender of patients with multimorbidity affects the treatment provided by their general physicians, shedding light on potential gender biases existing in the healthcare delivery system in Germany. Although the assessment of patient satisfaction through the EUROPEP summary score did not yield statistically significant differences between genders, there were three EUROPEP items in which such differences were found. Women rated "confidentiality of patient information, and, particularly, "access to the GP via phone" better, while men gave a better rating for "waiting times at the practice". These highlight the importance of privacy, communication channels between the patient and their GP, and efficient service delivery to enhance patient satisfaction in the healthcare system.

According to the results of this study, patients are satisfied with the clinical performance of their GPs as is found in the literature also (Grol et al., 2000). Similar studies like (Sebo et al., 2016) in which although the aspects of accessibility and availability of organization of care have been found to have high satisfaction levels, the two items namely, the possibility to speak to the GP by phone and the waiting time in the waiting room were less or poorly rated (Ali et al., 2012) (Baltaci et al., 2012). More such studies like (Kokcu, 2020) have found the highest and lowest satisfaction rates to be for "keeping records and data confidential" and "waiting time in the waiting room" on their used EUROPEP instrument. They found further differences where there were lower levels of satisfaction for female patients in contrast to male patients in their descriptive features unlike our present study. The study (Al-Abbad, 2015) has found a positive association of female patients with consultation time which exposes the doctor-patient relationship, where more time is devoted to them on account of their psychological problems. However, no such association could be established for male patients.

The sociodemographic results for a sample of 64 patients revealed mean age of 75.3 years with gender distribution skewed towards female who comprises 59.4% of the sample. This profile is also consistent with the trends that are observed in country's general demographic profile, where women outnumber men due to factors like longevity and health-seeking behaviour (Rochon et al., 2021) (United Nations, Department of Economic and Social Affairs, Population Division, 2017)

(Federal Statistical Office, 2016). Moreover, the importance of social support networks in the later stages of life is highlighted by the results as majority of the patients were married and lived with either spouses or partners (Robert Koch-Institut, 2017).

Education levels of the sample showed variety with a remarkable proportion having completed primary school education and pursuing vocational training. Moreover, migration status reflected diversity within the sample, where a majority was born in Germany but a prominent presence of diverse background individuals.

The health status assessment using EQ5D questionnaire provided insights into the physical and mental well-being of the participants, where the subjective health assessments marked an overall positive perception of health among the participants, with the majority reported feeling healthy. While a considerable proportion of the participants reported no problems with mobility, self-care, and daily activities, a subset of the sample experienced varying degrees of pain, discomfort, and anxiety or depression with no differences in either gender category.

Regression analyses explored the association between patient satisfaction and factors like gender, age, and health status. Although the models yielded mixed results and no significant associations were observed between patient satisfaction and clinical performance or organization of care, however, EQ5D scores showed a potential association with satisfaction regarding organization of care which shows that people who have better quality of life give better ratings to the organization of care. This underlines the importance of patients' health-related quality of life in healthcare delivery.

In Europe, patients consider good care in general practice as the amount of time and attention their GPs give to listen to their problems, the confidentiality in maintaining their records, and in case of emergency, the speed at which services are provided from general practice. These criteria were found to be particularly positive in European patients whereas, in the organization of care aspect, evaluations were negative for accessibility and organization of preventive services and waiting times in the study (Grol et al., 2000).

A study suggests a positive relationship between the increasing age and patient satisfaction. The findings indicate that the complexity of morbidity or if the load of care is heavier, causes a lower satisfaction level with GP care, irrespective of sociodemographic aspects of morbidity. Exploring gender differences in patients' care experiences has been a largely overlooked approach (Poot et al., 2014). Women have rated hospital care poorer than men, which is significant for highlighting gender differences in perceptions of quality of care as women want privacy during their visiting hours more than men and prefer to have better pain management and nursing care (Teunissen et al., 2016).

Literature has shown in studies (Lim et al., 2019) that women tend to consult their GPs for pain-related complaints more often in contrast to men (Thompson et al., 2016) (Hagen, 2000) with a possible explanation that men might have higher threshold for pain than women (Alabas et al., 2012) (Robinson et al., 2001). Studies have also reflected that women access healthcare services for psychosocial concerns reporting mental health issues more often than men (Hagen, 2000). The explanation for this inclination is the possibility of a lack of receptiveness for psychological complaints among men.

Gender making a significant difference at different stages of patient care, like prevention, diagnosis, treatment, and prognosis is suggested by a few studies that focused on the communication between doctor and patient (Baggio et al., 2013) (Janssen & Lagro-Janssen, 2012) (van der Meulen et al., 2017). An example of such study (Hamberg, 2008) has explored the presence of gender bias extensively in medicine from various approaches, for example, in clinical practice, in research, its origin as knowledge-mediated. In clinical practice, a huge discrepancy was discovered between men and women in a retrospective study of use of intensive care use. Another discovery indicated physicians' interpretation of symptoms differently, where they considered women's symptoms as psychosocial and men's organic, diagnosing female patients more nonspecific in contrast to men. In research also, one of the examples is depression, which is reported in women twice as men, because researchers focused on women more to be more thorough with the diagnosis grounds, despite men being dominant in alcohol and drug abuse. Knowledge-mediated gender bias is best described by the example of the perception and impression of migraine

as “women disorder” by the pharmaceutical industry, only because women are their common costumer than men.

(Arber et al., 2006) found that patients were diagnosed and treated differently by their GPs based on their gender; women were underdiagnosed for CHD, and were treated differently exposing the inequalities existing in healthcare. A study (Regitz-Zagrosek, 2012) has also brought attention to the inequalities in the diagnosis, treatment and, management of diseases based on gender and has urged for the pressing situation existing in German public health. (Karim et al., 2007) has revealed longer delays (Absolute number 3 days) for women than men in the diagnosis of Tuberculosis, especially women of older age, and explained how it puts the family and community at risk. Although the risk would not be the same but given the age of a multimorbid patient such bias by the GP can also put their health at risk, if not fatal.

Gender disparities amplify beyond prevalence rates to healthcare access, organization, and quality of care. Health inequalities are magnified by discrimination based on gender which is further exacerbated by intersecting factors like age, ethnicity, and socioeconomic factors. Various studies from different parts of the world have highlighted how gender bias influence the diagnosis and treatment of medical conditions giving rise to suboptimal care for women (*Gender and Health*, n.d.). Although Gender has found to have a remarkable role to play in costs for hospital care and medication, where men have been observed to have more expenditure than women (Stock et al., 2008), the database is still limited with respect to studies on gender differences in health behaviour (Hiller et al., 2017).

The attitude of healthcare providers toward gender and sex can influence their conduct towards their patients and may bias their assessments causing a huge impact on the care provided by them (Celik et al., 2011) (Kristoffersson et al., 2016). Therefore, it is crucial to have the awareness about gender differences in the context of society along with one’s gender identity role in health services to avoid and reinforce gender stereotypes (Hamberg, 2008). Healthcare systems have been working towards bringing down the rise of chronic diseases by acting on preventive behaviour for gender differences which has been a constant topic of discussion in public as well (Hiller et al., 2017). The new German Prevention Health Care Act augments the efficiency of male or female-directed

preventive measures by giving special consideration to gender-specific differences and the need to address them (PrävG, 2015). The paucity of gender or sex-sensitive evidence and the quality of the available ones in the literature is considered as one of the barriers for developing gender or sex-sensitive clinical guidelines along with the inadequacy of relevant gender or sex differences knowledge or awareness on an individual or professional level (Zeitler & Babitsch, 2018).

7. Strengths and Limitations

7.1 Strengths

To the best of my knowledge, no study similar to the present study was found in the literature, hence, this study fills that knowledge gap. This knowledge gap addresses the focus on gender disparities in healthcare delivery by exploring gender bias in the multimorbid patient who are 65 years or older in Germany. The study's inclusion criteria were patients aged 65 years and older with multimorbidity enrolled in Disease Management Programs (DMPs) rendering the study internal validity.

The recruitment of GPs from both rural and urban areas in the vicinity of Hamburg included regional differences in healthcare access and delivery, providing the generalizability of the findings across diverse settings. The integration of socioeconomic variables such as age, education level, and migration status in the study provides a thorough analysis of healthcare outcomes considering selected social determinants of health.

The experiences of patients and their health outcomes were analyzed by a multivariable approach. The approach engaged EQ5D questionnaires, and EUROPEP instrument to collect data on their health status (both mental and physical), and satisfaction with the healthcare delivery.

The study however, explored the existence of the third gender among the elderly population but probability of opening about their sexuality as non-binary is very low for patients who are 65 years old or more, but it would still be interesting to know their perception and understanding of the third gender, which can be explored by further research in future.

7.2 Limitations

The cross-sectional nature of the study can identify only associations and does not allow any casual conclusions and temporal relationships for interpretation of results. A longitudinal study would have explored the examination of changes over time and would have identified the causal pathways between patient characteristics, healthcare delivery, and outcomes.

The sample size of 64 patients for the study has limited the generalizability of the findings as a low sample size likely makes the probability of false negative results higher than the usual tolerated 20%. Therefore, the possibility of gender bias exists, but it could not be detected by this study. A larger sample size may increase the representation of the results by enhancing the statistical power, especially considering the diversity within the population of older adults with multimorbidity. The demographic results showed the reported gender as men and women only. This was one of the limitations as a non-binary category is not a popular and acceptable gender for the population above 65 years.

There is a possibility of selection bias due to the exclusion criteria of patients that did not allow vulnerable populations with functional disabilities, language limitations, cognitive impairments, and no access to telephonic interview to participate in the study. With the exclusion of these patients, the results may neglect important perspectives and experiences of healthcare access and quality of care among vulnerable populations.

Another potential bias in the study is self-reporting bias as the results are dependent on self-reported data through telephone interviews and questionnaires. Participants may provide socially desirable responses or inaccurate recall information, impacting the validity of the findings, with regard to health status and satisfaction with care in specific. It would be useful to examine the bias in a longitudinal study using standardized measures. Although the instruments used in the present study were standardized questionnaires, but future studies can probably obtain further information by providing participants with open-ended questions.

The study was observed completely through the lens of patient perspective and there was no data from GPs' interviews. Their perspective may have provided a cross-analysis of the response of the patients'.

The study analyzed only limited variables like gender, age, and health status despite having extensive demographical data. As the study focused on exploring gender bias, it may have overlooked other related factors such as specific ethnicity and socioeconomic status other than education. The inclusion of more variables would have given broader analysis of inequalities and

could have provided a more comprehensive understanding of disparities in healthcare access and outcomes.

8. Conclusion

Gender discrimination and biases are persisting worldwide in all healthcare systems which creates disparities in diagnosis, access to care, and treatment for patients with multimorbidity, women specifically. Therefore, it is essential to understand and address these biases to ensure equitable and quality healthcare provision for all patients, irrespective of gender or any other sociodemographic factors. The results of this study could not emphasize on the gender bias strongly and significantly; therefore, future in-depth research is needed for further confirmation.

This study reflected the complex association of multimorbidity, gender, and healthcare delivery using a cross-sectional study design. It contributes to the growing body of literature on multimorbidity management and healthcare delivery, concerning gender disparities. There is a dearth of research on gender prejudice in GPs' management of multimorbid patients, and the gender biases that were discovered did not occur in sample populations comparable to those used in this study. This expands the potential fields for future study.

The significant findings of patient dissatisfaction over access to their GP over the phone, waiting times at the practice, and confidentiality of their records directs to the possibility of improving overall healthcare quality by addressing privacy, communication, and service efficiency for vulnerable populations such as older multimorbid patients. Future research should explore interventions focusing on improving patient experiences and outcomes in healthcare settings, eventually contributing to a better quality of care for the elderly population.

9. References

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10. Statutory Declaration

I hereby certify that I am the sole author of this thesis and any or whole part of this thesis is not submitted for a degree to any other institution. I declare that this thesis does not violate any proprietary rights to the best of my knowledge. Any material, idea or quotes that has been derived from other sources are included are fully acknowledged and referenced properly.

Anshu Saini

Hamburg 02.07.2024

11. Appendix

Table 9: Patient satisfaction measured on EUROPEP instrument: Results

M = Mean, S.D = Standard Deviation

PEP Items	Male		Female		Combined		p-value
	M	S.D	M	S.D	M	S.D	
1. Did he give you the feeling that he had time for you during the doctor's visit?	3.23	0.95	3.27	0.96	3.25	0.95	0.87
2. Was he interested in your personal situation?	3.27	0.78	3.32	0.75	3.30	0.75	0.78
3. How easy did he make it for you to talk about your problems?	3.32	0.95	3.40	0.69	3.37	0.79	0.68
4. How did he involve you in decisions about your medical treatment?	3.15	0.97	3.48	0.71	3.34	0.84	0.14
5. How did he listen to you?	3.5	0.71	3.54	0.61	3.52	0.64	0.81
6. How was your data and documents treated confidentially?	3.58	0.58	3.84	0.37	3.73	0.48	**0.03**
7. Did he relieve your symptoms quickly?	3.23	1.02	3.12	1.02	3.16	1.01	0.71
8. How did he help you feel well enough to carry out your normal daily activities?	3.29	1.06	3.34	1.00	3.32	1.01	0.84
9. How thorough was he?	3.38	0.85	3.58	0.65	3.5	0.74	0.30

10. How did he perform physical examinations on you?	3.43	0.81	3.44	0.70	3.44	0.74	0.94
11. How did he offer you disease prevention services (e.g. preventive care, vaccinations, health checks, etc.)?	3.44	0.96	3.63	0.65	3.55	0.79	0.37
12. How did he explain the purpose of examinations and treatments to you?	3.5	0.98	3.42	0.77	3.45	0.85	0.71
13. How did he/she inform you about what you wanted to know about your complaints or illness?	3.32	1.07	3.41	0.78	3.37	0.91	0.70
14. How did he help you deal with your feelings about your health condition?	3.10	1.00	2.94	1.00	3	0.99	0.58
15. How did he explain to you the importance of following his advice?	3.15	0.92	3.38	0.99	3.28	0.96	0.36
16. How did he remember how he treated and advised you in previous consultations?	3.10	1.14	3.29	0.91	3.22	0.99	0.48
17. How did he prepare you for what to expect at the specialist or hospital?	2.78	1.31	2.57	1.21	2.63	1.16	0.66
18. How helpful were the other practice staff (apart from the doctor)?	3.65	0.63	3.65	0.63	3.65	0.63	0.97
19. How was it possible for you to get suitable appointments?	3.31	0.97	3.05	1.15	3.16	1.08	0.36
20. How easy was it to reach the practice by telephone?	2.52	1.26	2.46	1.30	2.48	1.28	0.86
21. How was it possible to speak to the GP yourself on the phone?	1.6	1.14	3.11	1.17	2.57	1.34	**0.04**

22. How were the waiting times at the practice?	3.19	0.75	2.73	0.93	2.92	0.89	**0.04**
23. How did you get quick help with urgent health problems?	3.37	0.90	3.46	0.74	3.43	0.80	0.69