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Editorial

Transformative Impact of Technology on Nursing Practices: A Paradigm Shift toward Enhanced Patient Care

Jamila Bibi.[1]

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In recent years, technology has become an indispensable tool in healthcare, revolutionizing the way nursing care is delivered and transforming clinical practices. From electronic health records (EHR) to telehealth platforms and advanced monitoring systems, technological innovations have empowered nurses to provide more efficient, accurate, and patient-centered care. This editorial explores the profound impact of technology on nursing practices, highlighting its benefits, challenges, and implications for the future of healthcare.

The integration of technology into nursing workflows has significantly enhanced efficiency and accuracy in various clinical tasks. Electronic documentation systems, such as EHR, have streamlined the recording and retrieval of patient data, minimizing errors associated with manual charting and improving care coordination among healthcare providers.[2] Moreover, automated medication dispensing systems and barcode scanning technologies have reduced medication errors, ensuring patient safety and quality of care.[1]

Technology has empowered nurses to take on more autonomous roles in patient care delivery. Point-of-care devices, such as portable diagnostic tools and handheld devices for accessing clinical information, enable nurses to make timely and informed decisions at the bedside, enhancing patient outcomes.[3] Furthermore, telehealth platforms have expanded access to healthcare services, allowing nurses to remotely monitor patients, deliver education, and provide virtual consultations, particularly in underserved communities or during public health crises.[4]

Despite its transformative potential, the adoption of technology in nursing practice is not without challenges. Issues such as technological disparities, inadequate training, and concerns regarding data privacy and security must be addressed to ensure equitable access and ethical use of technology in healthcare.[5] Moreover, the rapid pace of technological advancements necessitates ongoing education and professional development for nurses to adapt to evolving tools and best practices.

As technology continues to evolve, nursing professionals must embrace a proactive approach to integrate innovative solutions into their practice. Collaborative efforts between nurses, healthcare organizations, and technology developers are essential to harness the full potential of technology in improving patient outcomes and advancing the profession of nursing. Furthermore, research initiatives focusing on the effectiveness and impact of technology-enabled interventions are needed to inform evidence-based practice and policy development.[6]

The integration of technology into nursing practices represents a paradigm shift in healthcare delivery, offering unprecedented opportunities to enhance efficiency, empower nursing practice, and improve patient outcomes. By embracing innovation, addressing challenges, and fostering collaboration, nursing professionals can leverage technology as a catalyst for positive change and drive continuous improvement in the quality and delivery of patient care.

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Original Article

Effectiveness of thoracic manipulation versus scapular stabilization exercises on pain and functional disability in cervical spondylosis

Iqrash Fatima,[1] Afifa Ashraf,[2] Kainat Khalid,[3]

Abstract

Objective: To assess how effective thoracic manipulation and scapular stabilization exercises are in decreasing pain and improving functional ability in individuals with cervical spondylosis. The study compared their combined effectiveness in a single investigation, as past studies had only examined their individual impacts on neck pain.

Study design: It was a Randomized Control Trial study design.

Place and duration of study: The study was conducted from August 1st, 2021, to January 31st, 2022, at Islamabad Physiotherapy & Rehabilitation Center.

Material and Methods: An RCT was conducted where 30 patients were randomly assigned to two groups over a duration of six months. Eligible participants, aged 35 to 65, experienced neck pain persisting for at least three months, with confirmed cervical spondylosis. Exclusions included recent cervical spine surgery, cervical myelopathy or radiculopathy, and vascular syndromes. Whiplash injury history also excluded participation. Data collection employed questionnaires and the Neck Disability Index (NDI). Group 1 received Thoracic Manipulation, and Group 2 received Scapular Stabilization Exercises (3 days for two weeks), alongside conventional treatments (cervical stretching and cervical isometrics). Assessments occurred pre and post-intervention, with analysis using SPSS version 25.0.

Results: Total Mean score of NDI in group 1 was improved from 47.33 ±13.788 to 25.07 ±7.923 with p value of less than 0.001 whereas total mean score of NDI in group 2 was improved from 42.8 ±13.262 to 25.47±11.351 with p value of less than 0.001 thus significant improvements were noted in both groups. When both groups were compared, with p value greater than 0.05 showing that both the interventions applied were effective.

Conclusion: Both thoracic manipulation and scapular stabilization exercises demonstrate equal effectiveness in alleviating pain and reducing functional disability in individuals with cervical spondylosis.

Keywords: Spondylosis, Thoracic manipulation, Scapular Stabilization, Neck Disability Index, Neck pain, Functional disability

1. Introduction

Cervical spondylosis is a long-term, gradually worsening degenerative condition, often associated with aging. It results from the gradual wear and tear affecting specific segments of the cervical spine over time. The levels most commonly affected are C6-C7 and C5-C6.[1] Neck pain is the predominant symptom in cases of symptomatic cervical spondylosis, with an occurrence rate of 13%-15%. [2] Neck pain stands out as a major contributor to disability, with approximately 50% of individuals likely to persistently encounter some level of pain or experience recurring episodes.[3] Cervical spondylosis is a common issue as the neck spine ages. It happens when osteophytes form and narrow the spinal canal. This pressure can lead to direct damage to the nerves or changes in blood supply, causing problems in the spinal cord.[4] Neck pain often correlates with reduced health-related quality of life (HRQoL), affecting physical health, interpersonal relationships, and mental well-being.[5] Neck pain is more prevalent among working women than men, and its incidence and associated disability have notably increased over the past 25 years. This trend is expected to continue as the population ages.[6]

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Cervical spondylosis-related pain typically begins with conservative treatment, excluding red flags and surgical conditions. This treatment involves patient education, modalities, therapeutic exercises, non-thrust manipulations (mobilizations), and thrust manipulation techniques.[7] Manipulation techniques are found to be beneficial in treating neck pain. Manipulation of the thoracic spine is characterized by a swift, low-amplitude thrust targeted at any region of the thoracic spine. Typically, the upper thoracic levels are selected for manipulation to address neck discomfort.[8] The cervical and scapular regions are interconnected, implying that dysfunction in one may have ramifications on the other due to their anatomical and functional relationship. Strengthening scapular muscles and mobilizing the scapula can alleviate pain in the thoracic and cervical spine. Scapular stabilization exercises involve movements like scapular retraction, lateral pull-downs, shoulder shrugs, and push-ups.[9]

In a study led by Javier Gonzalez-Iglesias et al., thrust manipulation in the thoracic spine was investigated for its impact on individuals with neck discomfort. Findings indicated significant improvements in clinical outcomes among those experiencing neck pain. The manipulation group exhibited greater enhancements in pain and disability scores compared to the control group.[10] In a study by Palesa A. Huisman et al. on thoracic spine manipulation for neck pain relief, therapeutic benefits were evident. Combining thoracic manipulation with electrotherapy notably reduced pain and dysfunction, surpassing outcomes with electrotherapy alone. Moreover, thoracic manipulation consistently showed superior efficacy.[11] John Krauss and colleagues conducted a study on upper thoracic spinal manipulation's effect on neck pain and cervical motion restrictions, focusing on T1 to T4. The study group received manipulation targeting less mobile upper thoracic segments, showing enhanced cervical rotation range and potential pain relief in the cervical region.[12] Boyoung Im et al. investigated the impact of scapular stabilization exercises on neck posture, pain levels, and quality of life in individuals with neck discomfort. Fifteen participants were divided into Group A, receiving scapular stabilization exercises, and Group B, the control group performing relaxation exercises. Post-training, the scapular stabilization group showed significant improvements in head-to-spine alignment, upper trapezius and serratus anterior muscle engagement, Neck Disability Index ratings, and Visual Analog Scale pain ratings.[13] Christoffer H. Andersen et al conducted research on outcome of scapular exercises on chronic neck pain. Their study concluded that, in people with chronic pain in the neck region, scapular exercise lower pain intensity and increase shoulder elevation strength. There was substantial improvement in pain levels.[14] Jeong-Il Kang et al. researched the effectiveness of scapular stabilization exercises in improving neck alignment and muscle activity to alleviate neck pain. The study found scapular stabilization exercises to be a beneficial intervention for muscle strengthening. Enhanced posture, facilitated by activated neck muscles, contributed to the reduction of associated neck pain.[15]

The objective of this study was to compare thoracic manipulation and scapular stabilization exercises for pain relief and reduced disability in cervical spondylosis patients. Unlike prior research focusing on these interventions separately on neck pain, this study uniquely assessed both within a single trial.

2. Materials & Methods

A randomized controlled trial was conducted from August 1st, 2021, to January 31st, 2022, at Islamabad Physiotherapy & Rehabilitation Center. Thirty participants of both genders were included, with sample size calculated using the open-epi sample size calculator with a 5% level of significance and 95% confidence interval. Non-probability convenient sampling was utilized, followed by random allocation into control (n=15) and experimental groups (n=15) using the Sealed Envelope Method. Eligible participants experienced neck pain for at least three months, were aged between 35-65 years, and had a diagnosed case of cervical spondylosis. Exclusion criteria included a history of cervical spine surgery in the previous 12 months, diagnosis of cervical

myelopathy or radiculopathy, vascular syndromes such as vertebrobasilar insufficiency, and a history of whiplash injury. Data collection employed a questionnaire containing demographic details and the Neck Disability

Index (NDI) to measure pain and disability levels. Group 1 received Thoracic Manipulation for two weeks, performed three days a week, with manipulation applied at the upper thoracic level using the Thoracic Screw Manipulation

Technique. Group 2 received Scapular Stabilization Exercises for two weeks, including shoulder shrugs, chair press-ups, and scapular retractions, performed three days a week. Data were collected at baseline and after two weeks of intervention using the NDI and analyzed using MS Excel and SPSS version 25.0. Inferences were drawn using paired and independent samples t-tests and represented in the forms of graphs and tables.

3. Results

The objective of this study was to compare the effectiveness of thoracic manipulation versus scapular stabilization exercises on pain and functional disability in cervical spondylosis. Patients were divided into two Groups. Group 1 received the thoracic manipulation, Group 2 received Scapular Stabilization Exercise regime. A total of 30 patients were included with a mean age of 49 years in Group 1 and 46 years in Group 2. The majority of participants were female (25 out of 30), with diverse occupational backgrounds including housewives, office workers, tailors, laborers, retirees, and teachers. Within-group analysis revealed a significant improvement in Neck Disability Index (NDI) scores for both groups after two weeks of intervention (Group 1: pre-intervention mean score of 47.33 ±13.788 improved to 25.07 ±7.923; (Table I and Figure I) Group 2: pre-intervention mean score of 42.8 ±13.262 improved to 25.47 ±11.351), with p-values less than 0.001. (Table I). However, between-group analysis using independent t-tests showed no significant difference in mean NDI scores post-intervention (p > 0.005). These findings suggest that both thoracic manipulation and scapular stabilization exercises are effective in reducing pain and functional disability in cervical spondylosis patients, with no significant difference observed between the two interventions. (Table II).

Variable		Baseline (Mean ± SD)	After II Weeks (Mean ±SD)	P Value
Total NDI Score	Group I	47.33±13.788	25.07 ±7.923	<0.001***
	Group II	42.8 ±13.262	25.47 ±11.351	<0.001***

Table I: Paired t test showing comparison of means pre and post intervention in Group I & Group II

Variable	At Baseline		P value	After II weeks		P value
	Group I Mean ±SD	Group II Mean ±SD		Group I Mean ±SD	Group II Mean ±SD	
Total NDI Score	47.33±13.788	42.8±13.262	0.367	25.07±7.923	25.47±11.351	0.912

Table II: Independent samples t test showing comparison of means between the Groups pre and post intervention.

4. Discussion

In this study, we explored the efficacy of thoracic manipulation and scapular stabilization exercises in alleviating pain and functional impairments among patients diagnosed with cervical spondylosis. Our findings, as indicated by the independent t-test results with a p-value > 0.05, suggest no significant difference between the two intervention groups, implying that both thoracic manipulation and scapular stabilization exercises led to improvements in pain levels and functional impairments. These results align with previous research, such as the study conducted by Javier Gonzalez-Iglesias et al., where patients undergoing thoracic spine manipulation showed greater improvements in pain and disability compared to those receiving electro/thermal treatment alone.[10] Similarly, our study's second group, undergoing scapular stabilization exercises, also exhibited improvements in

pain scores and functional disability, as reported in the study by Boyoung Im et al where he inspected the effects of scapular stability exercise on posture, pain levels, and functional impairments. The group receiving scapular stabilization exercise regime displayed remarkable enhancements in the head-to-spine alignment, upper trapezius muscle engagement, serratus anterior muscle engagement, Neck Disability Index ratings and Visual Analog Scale ratings for pain.[13] Although cervical thrust joint manipulation has shown significant benefits in previous research, as the study conducted by Emillo J. Puentedura's demonstrated significant improvements in NDI and pain levels with cervical thrust joint manipulation[16] our study suggests that thoracic manipulation can also yield positive outcomes, particularly in cases where cervical manipulation is not recommended or poses risk. Thus, provides a potentially safer alternative for optimizing patient outcomes while minimizing risks associated with cervical manipulation.

Cross et al. demonstrated that in situations where cervical thrust manipulation is contraindicated, thoracic thrust manipulation presents favorable results and that manipulation of the thoracic spine enhances pain relief, range of motion, and self-reported function in individuals experiencing mechanical neck pain.[17] Considering the potential risks associated with cervical spine manipulation, utilizing thoracic spine manipulation may serve as a prudent alternative to optimize patient outcomes while mitigating associated risks.

Cagnie et al. revealed that neck pain often coincides with scapular dyskinesia and malalignment.[18] Thereof the effectiveness of thoracic manipulation and scapular stabilization exercises in our study highlights their potential as viable treatment options for managing cervical spondylosis. Scapular stabilization exercises, in particular, offer advantages such as ease of performance and incorporation into patients' home exercise plans (HEPs). This is supported by Ha-yeon Kim's study, where scapular stabilization exercises significantly improved pain scores and functional abilities.[19] Arsh et al.'s research on manual therapy to the cervical and upper thoracic spine highlighted the effectiveness of providing therapeutic intervention in closely linked regions to alleviate symptoms and provide relief. [20] Therefore, endorsing the validation for examining the effectiveness of therapeutic interventions focusing on interconnected regions, our study underscores the significance of our approach in tackling cervical spondylosis via scapular stabilization exercises and thoracic manipulation.

In our study, employing both the independent t-test and paired t-test demonstrated the effectiveness of thoracic manipulation and scapular stabilization exercises. Utilizing the Neck Disability Index as our measure, a decrease in disability scores indicated improvement in patients receiving both interventions. Notably, the comparison of mean NDI scores between the two intervention groups showed no significant difference, affirming both interventions' efficacy in managing cervical spondylosis. Thoracic manipulation and scapular stabilization exercises offer distinct yet effective treatment options, as demonstrated in this study, supporting their utilization in clinical practice.

Conclusion:

It is concluded from the study that thoracic manipulation technique and scapular stabilization exercises are equally effective in reducing pain and functional disability in patients with cervical spondylosis.

Recommendations:

Long-duration follow-up should be conducted post-intervention to assess the sustainability of intervention effects. Future studies may explore additional techniques of thoracic manipulation to expand the understanding of their efficacy. Furthermore, comparative studies between cervical and thoracic manipulation techniques in patients with cervical spondylosis could elucidate the most effective approach for this condition. Additionally, comparing scapular mobilizations with scapular stabilization exercises could provide insights into their relative effectiveness.

Limitations of the study:

The study lacked long-term follow-up to evaluate the maintenance effects of the interventions post-cessation.

Additionally, resource constraints limited the scope of the study and may have impacted its generalizability.

Disclosure & Conflict of Interest:

The authors have no conflict of interest. This research didn't receive any specific grant from funding agencies in the public, commercial or not for profit sectors.

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Original Article

Effect of exercises on gestational diabetes mellitus in females of third trimester during pregnancy

Afifa Ashraf,[1] Iqrash Fatima,[2] Huma Tabassum,[3]

Abstract

Objective: To ascertain how low-impact exercise affects gestational diabetes mellitus in the third trimester and Compare the efficacy of normal prenatal treatment both on alone and in conjunction with low-impact workouts and physical activity to manage gestational diabetes mellitus.

Study design: It was a Randomized Control Trial study design.

Place and duration of study: The study was conducted in The Physiotherapy Clinic, Saidpur Road, Rawalpindi from 1st August 2021 to 31st January 2022.

Material and Methods: Sample size was calculated by using open epi sample size calculator with 5% level of significance and 95% level of confidence. 30 females were selected by using non probability convenient sampling initially and then randomly allocated into control and experimental groups. Inclusion criteria encompassed obese/overweight females in their 3rd trimester, aged 25-40 years. Females with specific medical conditions and without GDM were excluded. Assessment was done by using data collection tools (OGTT, Weight (kg) BMI).Outcome measures are diastolic, systolic blood pressure, fasting plasma glucose, 1 hour and 2 hours plasma glucose after meal. Data was analyzed by using SPSS version 21. An independent sample t-test was used for comparison of means between the groups.

Results: Out of 30 females, there were 15 in each group and there was a statistically significant differences of all outcome measures from baseline values for both groups($p<0.001$).However, the experimental group's statistical outcomes were better than those of the control group in terms of plasma glucose levels at fasting, one hour, and two hours.($p<0.001$).

Conclusion: It is concluded that low-impact exercises are found to effectively manage glucose levels in females during the third trimester and minimize the complications associated with gestational diabetes mellitus.

Keywords: Gestational Diabetes Mellitus, Impaired Glucose Intolerance, Body mass index, Oral Glucose Tolerance Test, Big Baby syndrome.

1. Introduction

Diabetes mellitus, a metabolic disorder, entails insulin secretion defects causing chronic hyperglycemia and disruptions in carbohydrate, fat, and protein metabolism.[(1)] Type 1, Type 2, and gestational diabetes are the three main forms of diabetes mellitus.[(2)] Type 1 diabetes, an autoimmune condition, is often diagnosed in childhood or adolescence, marked by high blood glucose levels due to insufficient insulin from pancreatic β-cell loss.[(3)] Type 2 diabetes results from lifestyle and genetic factors like physical inactivity, prolonged sedentary behavior, smoking, excessive alcohol intake, and notably, obesity.[(4)] Whereas GDM is characterized by glucose intolerance or high blood glucose concentration during gestation.[(5)] Despite sharing diagnostic criteria and screening methods, GDM prevalence ranges from 1 to 28% globally, influenced by factors like age, ethnicity, obesity, lifestyle, and type 2 diabetes.[(6)] Type 2 diabetes prevalence mirrors GDM rates, with ethnic disparities; for example, in the US, non-Hispanic white women have lower GDM rates than others. Age, obesity, lifestyle, and geography globally influence GDM prevalence.[(7)]

Long-term insulin resistance leads to pancreatic ß-cell dysfunction, reducing glucose tolerance and causing

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gestational diabetes mellitus (GDM). GDM, akin to transient type 2 diabetes, is triggered by pregnancy-related hormonal and metabolic changes.[8] Obesity, sedentary lifestyle, family history, advanced maternal age, and any type of diabetes prior to gestation are general risk factors for gestational diabetes mellitus. (11) Pre-pregnancy and prenatal lifestyles, including diet, impact the risk of gestational diabetes mellitus (GDM). Daughters of smokers have a higher chance of developing GDM. Chronic diabetes mellitus results in organ damage affecting the kidney, heart, nerves, retina, and blood vessels.[9]

Gestational diabetes mellitus (GDM) links to severe complications like pre-eclampsia, hypertension, preterm birth, and more cesarean deliveries, increasing risks of postpartum type II diabetes, impaired glucose tolerance, and perinatal morbidity.[10]

For diagnosis, an oral glucose tolerance test (OGTT) is conducted when casual blood glucose readings are inconclusive. After an overnight fast of 8-14 hours, fasting plasma glucose levels are measured, followed by readings one and two hours after a 75-gram oral glucose load. The OGTT specifies fasting glucose should be <95 mg/dl, 1-hour glucose <180 mg/dl, and 2-hour glucose <155 mg/dl.[11] Treatment may encompass dietary advice (standard or specific), physical therapy, and pharmacological options like oral antidiabetic drugs[12] such as Metformin,[13] Sulfonylureas (e.g., glyburide),[14] and basal and prandial insulin.[15] Rhythmic use of large muscle groups is advantageous with no adverse effects. A daily 30-minute brisk walk effectively regulates blood glucose levels, ideal for beginners with mild aerobic benefits and low joint strain.[16] Weekly 20–30-minute stationary cycling sessions raise postprandial and fasting glucose levels, enhance glycemic control, and boost cardiorespiratory fitness.[17]

Yoga and mindful eating aid glycemic control in pregnant GDM patients, but avoid certain poses like abdominal-pressure, twists, and lying flat on the back to prevent circulation issues during pregnancy, per clinical recommendations.[18] Pilates exercise during pregnancy enhances labor quality and lowers blood glucose levels without causing harm to the mother or fetus.[19] Low to moderate intensity racquet sports are considered safe if a female is already used to play racquet.[20] Avoid vigorous racquet sports like badminton, tennis, and racquetball during pregnancy due to increased risk of falls for women.[21] These low impact exercises recommended for 150 minutes, starting from 5- 10min/day to 30 minutes a day, five days a week and of low to moderate-intensity based on the patient's tolerance and rate of perceived exertion.[22] During pregnancy, avoid contact sports and high-risk activities; opt for low-impact cardio workouts like brisk walking and modified yoga.[23] Throughout gestation, increased ligamentous and joint laxity due to hormonal changes heightens injury risk, necessitating low to moderate intensity physical activity.[24] Research suggests regular pregnancy exercise enhances muscle adaptations, insulin sensitivity, and glucose absorption, benefiting short-term glucose management and improving metabolic health in women with GDM.[25] Laredo-Aguilera et al.'s study recommends aerobic, resistance, or combined exercises at moderate intensity (20-50 minutes, twice a week) for controlling gestational diabetes mellitus effectively.[26] A supervised physical activity program starting early and continuing throughout the pregnancy can lower the risk and complications of these issues.[27]

This study aimed to investigate the effects of exercise on gestational diabetes mellitus (GDM) by assessing the impact of low-to-moderate intensity exercise during the third trimester and its role in preventing complications. By addressing this gap in the literature, the study offers valuable insights into evidence-based treatment, raising awareness among physicians and the population about the preventive benefits of these exercises for GDM and its complications.

2. Materials & Methods

A randomized control trial was done from 1st august 2021 to 31st January 2022 at The Physiotherapy Clinic, Saidpur Road, Rawalpindi. 30 female patients of gestational diabetes mellitus were included in this

study. Sample size was calculated by using open-epi sample size calculator with 5% level of significance and 95% confidence interval. Non-Probability Convenient Sampling and then Random Allocation into control (n=15) and experimental groups (n=15) by Sealed Envelope Method.

Obese, overweight and females of gestational age 27-40 weeks in their 3rd trimester, aged 25-40 were included. Additionally females with an increased risk of gestational diabetes were part of the study population. The study excluded females with medical conditions such as significant heart disease, restrictive lung disease, Persistent 2nd and 3rd trimester bleeding, ruptured membrane, multiple gestation at risk of premature labor and poorly controlled hyperthyroidism. Additionally females without gestational diabetes mellitus were not included in this study.

Data was collected by using semi-structured questionnaire based on demographics, weight, BMI and OGTT. Experimental group was treated with standard antenatal care for gestational diabetes mellitus, and was regularly supervised for exercise program. The exercise program was started from the time of diagnosis of diabetes until birth. It was performed three times per week and sessions lasted 30-40 min plus daily brisk walk of at least 30 min. Control group received only standard antenatal care which includes pharmacological management and dietary precautions. Data was entered and analyzed using MS excel and SPSS version 21. Inference was made by using paired and independent samples t-test and represented in the forms of graphs and tables**.**

3. Results

Within the study population 11 females who had a history of previous GDM, 16 females had a family history of DM,15 females had history of PCO and 6 females were physically active out of thirty participants.

Table. I-Previous History of Study Population

Variable		Count	Group		P value (chi square)
			Experimental N=15	Control N=15	
GDM	YES	11 36.66%	6 54.5%	5 45.5%	0.705
	NO	19 63.33%	9 47.4%	10 52.6%	
F.H	YES	16 53.33%	6 37.5%	10 62.5%	0.143
	NO	14 46.67%	9 64.3%	5 35.7%	
PCO	YES	15	6 40.0%	9 60.0%	0.273
	NO	15	9 60.0%	6 40.0%	
ACTVITY STATE	YES	6	4 66.7%	2 33.3%	0.361
	NO	24	11 45.8%	13 54.2%	

GDM; history of gestational diabetes mellitus.
F.H; family history of diabetes mellitus.
PCO; polycystic ovary syndrome.
Activity state; physical activity state of population.
Stress; level of stress in patient

Mean diastolic BP in Experimental group was 86.33±6.114 and in Control group it was 90.00±9.258 with p value .211.Mean of systolic BP in Experimental group was 122.33±7.037 and in Control group it was 127.33±7.988 with p value .080.Mean of age in Experimental group was 31.53±2.924 and in Control Group it was 33.53±3.701 with p value .112.Mean BMI in Experimental group was 29.50±1.427 while in Control group it was 28.33±3.288 with p value.218.Mean weight in Experimental Group was 81.27±3.674 and in Control group it was 85.67±7.168 with p value .043.Mean diastolic BP in experimental group was 102.67±11.782 and in control group it was 100.67±12.799 with p value .660.Mean of systolic BP in Experimental group was 142.33±11.629 and in Control group it was 144.00±16.388 with p value .750.Mean of fasting plasma glucose in Experimental group was 218.53±41.933 and in Control group it was

283.00±97.409 with p value.026.Mean of 1 hour PG in Experimental group was 283.00±97.409 and in Control group it was 372.67±96.988 with p value .229 .Mean of 2 hour PG in Experimental group was 280.32±60.375 and in Control group it was 320.33±101.567 with p value .199.

Table. II

Independent T test showing comparison of means of baseline clinical parameters and age between two groups:

Variables	Study Group		P value (independentt te
	Experimental N=15	Control N=15	
Age	31.53±2.924	33.53±3.701	.112
BMI	29.50±1.427	28.33±3.288	.218
Current Weight	81.27±3.674	85.67±7.168	.043
Diastolic blood pressure	102.67±11.782	100.67±12.799	.660
Systolic blood pressure	142.33±11.629	144.00±16.388	.750
Fasting plasma glucose of Patient	218.53±41.933	283.00±97.409	.026
One hour plasma glucose of Patient	337.20±55.618	372.67±96.988	.229
Two hour plasma glucose of Patient	280.32±60.375	320.33±101.567	.199

Mean of fasting plasma glucose in Experimental group was 91.00±3.505 and in Control group it was 210.00±70.837 with p value less than 0.001.Mean of 1 hour PG in Experimental group was 174.67±4.593 and in Control group it was 295.33±76.846 with p value less than 0.001 Mean of 2 hour PG in Experimental group was 148.53±4.912 and in Control group it was 250.67±68.056 with p value less than 0.001.

Table. III

Independent T test showing comparison of means of post intervention clinical parameters between two groups:

Variables	Study Group		P value (independent t test)
	Experimental (N=15)	Control (N=15)	
Diastolic blood pressure	86.33±6.114	90.00±9.258	0.211
Systolic blood pressure	122.33±7.037	127.33±7.988	0.080
Fasting plasma glucose of Patient	91.00±3.505	210.00±70.837	<0.001
One hour plasma glucose of Patient	174.67±4.593	295.33±76.846	<0.001
Two hour plasma glucose of Patient	148.53±4.912	250.67±68.056	<0.001

4. Discussion

According to the present study, there were significant improvements observed in both the experimental and control group. However, mean score of the groups showed more improvement in experimental group, who received antenatal care combined with exercises as compared to control group. The control group received antenatal care only not showed much improvement in symptoms and decrease in blood glucose level as compared to the experimental group so they needed more dose of medicines and insulin to control their blood glucose level as compared to experimental group.The patients of experimental group showed marked reduction in antenatal and postnatal depression because of exercises and physical activity. Whereas there was no reduction in antenatal and postnatal depression in control group.

A study found that pregnant women with a predisposition to gestational diabetes mellitus could successfully reduce their blood glucose levels through moderate-intensity aerobic exercise. It revealed a significant decrease in fasting blood glucose and insulin levels in both groups, with a high statistically significant difference (p-value of 0.0001) favoring the interventional group. It relates to the current study as both studies revealed significant decrease in blood

glucose and insulin levels with a high statistically significant decrease in interventional group. [28]

According to the findings of another study, pregnant women who followed a modified GDM meal plan should walk for at least 25 minutes at either low or vigorous intensity if they were at low risk for GDM, or for 35–40 minutes at low intensity if they were at risk for GDM in order to achieve the best decline in glucose concentrations. However in current study daily brisk walk for about 30 minutes, Stationary cycling, modified yoga, modified Pilates, racquet sports were performed for 3 days/week for about 30-40 min at low to moderate- intensity. They only recommended walk to control GDM whereas current study also included other low impact safe aerobic exercises along with walk to control GDM. These exercises gave multiple effects along with GDM, such as lowering depression, weight gain, Diastolic and Systolic blood pressure in patients who have increased blood pressure during their pregnancies. [29]

A study demonstrated that high resistance exercise training may assist overweight women with gestational diabetes mellitus avoid insulin therapy, according to a systemic review and meta-analysis. In the current study low to moderate intensity aerobic exercises were applied and it showed considerable lowering of blood glucose level in patients of third trimester. We cannot recommend high intensity exercises as some high or moderate intensity resistance exercises can cause excessive exertion in females and have negative effects on pregnancy. [30]

Conclusion:

The study concludes that low impact exercises have an effect on Females in controlling their plasma glucose levels during third trimester. These exercises prevent the complications of gestational diabetes mellitus. Females who did these exercises along standard antenatal care for gestational diabetes mellitus have more controlled glucose level than the females who were only on standard antenatal care.

Recommendations:

The combination of various exercise interventions should be used to find their effect on blood glucose levels. At initial stage Gestational Diabetes Mellitus should be treated with exercises alone, but later combined with pharmacological interventions.

Long-term follow-up of therapies with more sample sizes is recommended as the main focus of future research studies. Some other exercises such as active and passive stretching can be incorporated in future studies.

Limitations of the study:

The limitations of current study are:

1. No long term follow up of patients was done after the interventions stopped to determine the maintenance effects.
2. Lack of resources.
3. Poor compliance of the patients with home plan provided.
4. More sample size for generalizability of results.

Disclosure & Conflict of Interest:

The authors have no conflict of interest. This research didn’t receive any specific grant from funding agencies in the public, commercial or not for profit sectors.

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Original Article

Prevalence of Achilles tendinopathy due to prolonged standing among salesperson working in shopping malls of twin cities

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Abstract

Objective: To find out the Prevalence of Achilles tendinopathy due to prolonged standing among salesperson working in shopping malls of twin-cities.
Study design: It is a descriptive cross-sectional study design.
Place and duration of study: The study was conducted in shopping mall of twin-cities among sales person with in time period of 4 months.
Material and Methods: The study was conducted on June 2023 to September 2023. We had 285 participants, both male and female salespersons aged 26 to 45 years old, who spent over 5 hours a day standing in shopping malls in twin-cities. Data was collected using standardized scales, the VISA-A sedentary scale and the LEFS scale. After taking informed consent data was analyzed using SPSS version 26, frequencies and percentages were calculated for individual variables.
Results: If LEFS score range from 61-80 and VISA-A score range from 61-100 then this condition is not prevalent among study participants, through that 54.7% participants are not prevailing. Conversely, If LEFS and VISA-A score range from 0-60 then this condition is prevalent among study participants. According to our results the prevalence of Achilles tendinopathy is 44.3% (126) due to prolonged standing among salespersons.
Conclusion: Our study concluded that there was an Average alliance of Achilles tendinopathy in salespersons due to prolonged standing in shopping malls of twin-cities.
Keywords: Achilles Tendinopathy, Heel pain, Victorian Institute of Sports Academy self-administered - Achilles sedentary scale, Lower extremity functional Scale, Salesperson.

1. Introduction

Achilles Tendinopathy (AT) is a medical issue that happens when the Achilles tendon gets hurt, but it doesn't completely rupture, as this usually happens because of using it too much. (Matthews, Ellis, Furness, & Hing, 2021). It is essential to note that this condition is not exclusively limited to athletes, it can also affect general population. **(1)**

The Achilles tendon (At) is well-known for its strength and size, it is located at the back of the heel and plays an important role in connecting the heel bone to the calf muscles and facilitates essential movements like running, walking, and jumping.**(2)**

The pathophysiology begins with reactive tendinopathy, where there is an increase in tenocyte proliferation, protein production, and thickening of the tendon. As the condition advances, it enters the tendon disrepair stage, characterized by further increases in tenocytes and protein production, along with focal disruption of collagen fibers. The final stage is degenerative tendinopathy, where cell death occurs, and there is significant disorganization of collagen.**(3)**

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Depending upon the location Achilles tendinopathy is classified as: insertional tendinopathy and midportion tendinopathy.[4] The usual clinical presentation of Achilles tendinopathy involves the combination of three main symptoms: pain in and around the tendon, swelling, and impaired function, particularly during activities that involve walking, standing and impact exercises. Morning stiffness can also be seen in patients but subsides with activity.[4]

Midportion is more common and is located between 2 cm to 6 cm proximal to the insertion site.Insertional Achilles tendinopathy refers to a condition that occurs at the Achilles tendons insertion point on the calcaneus.[5]

Achilles tendinopathy can be influenced intrinsically by older age, male sex, poor vascularity, hyper-pronation, biomechanical issues, systemic diseases.Extrinsically by overuse, repetitive stress, prolonged standing and intense physical activity. Steroidal drugs and fluoroquinolone antibiotics can also cause Achilles tendinopathy.[6]

Among athlete's lifetime prevalence of AT is around 24%, In contrast, the general population has prevalence of approximately 6% while in the adult population aged 21 to 60 years, the incidence of AT injuries is approximately 2.35 per 1,000 people, making them quite common.[7]

The clinical diagnosis of Achilles tendinopathy primarily relies on patient history, patient-reported pain associated with loading activities, and pain provocation tests. These tests are single leg heel raise, hop test, Thompson test, or Pain on palpation, etc have been suggested in examination.[8] Besides tests VISA-A sedentary scale, is a reliable assessment tool. It can be combined with other scales like VAS, FFI, LEFS, or FAOS to help diagnose AT. Among these, LEFS is the best when used alongside the VISA-A scale for diagnosis.[9]

ESWT is an interventional approach, involves delivering shock waves directly to the painful area of the tendon. This non-invasive procedure aims to promote healing and reduce pain in the affected tendon.[10] The application of ultrasound waves to the affected area may help reduce inflammation and promote the healing process.[11] By applying heat to the affected tendon, blood vessels dilate, and blood flow to the area increases.[12] Deep Transverse friction massage (DTFM) is a technique commonly utilized by physiotherapists in the treatment of tendinopathies.[13] Some common types of exercises used in the conservative management of AT includes, Eccentric exercises have been shown to be effective in strengthening the tendon and promoting its healing.[14] Isometric exercises can help improve tendon strength without placing excessive stress on the tendon.[15] NSAIDs are often suggested to treat tendinopathies.[16] If conservative treatments for Achilles tendinopathy do not result in significant improvement after six months, surgical intervention may be considered.[16]

Our study will help more people know about this condition. It will be good for salespeople to know about their poor foot health during work with prolonged standing. It will also be useful for Physiotherapists and Doctors, they can better understand, assess, and raise awareness about Achilles tendinopathy, especially when it's not just caused by sports but also by long hours of standing on the job.

2. Materials & Methods

Cross-sectional descriptive study was done with in time duration of 4 months. Sample size of 285 salesperson was taken by raosoft calculator in this study. Data was collected from Islamabad Safa Gold Mall, Giga Mall, Centaurus Mall and Rawalpindi Malik-Abad Plaza, Rabi Centre, Gulf Centre, Ashiana Centre, Al-Jannat Mall, Butt Mall, Midway Centrum after seeking permission. Non-Probability purposive sampling technique was used for this study. Both male and female , above 25 to 45 years of age salesperson, Salesperson who are standing for more than 5 hours a day were put in the study. Salesperson doing jobs for more than two years were included in this study while Salesperson with any kind of foot deformity, fractures and systemic illness , salesperson who were not falling in our

preselected criteria were excluded from the study. To conduct a thorough evaluation, we integrated the Lower Extremity Functional Scale (LEFS) into our study, in addition to a standardized VISA-A Sedentary questionnaire. The VISA-A sedentary scale comprises a total of 100 points, categorized as follows: 0-30 as very poor, 31-60 as poor, 61-90 as good, and 91-100 as excellent. The LEFS scale consists of a total of 80 points, which are divided into categories as follows: 0-20 for severe functional limitation, 21-40 for moderate functional limitation, 41-60 for mild functional limitation, and 61-80 for normal functioning. If LEFS score range from 61-80 and VISA-A score range from 61-100 then this condition is not prevalent among study participants. Conversely, If LEFS and VISA-A score range from 0-60 then this condition is prevalent among study participants. After taking approval from CASHT Research committee, then we took permission from manager of shops for data collection. After informed consent from salesperson and taking demographics then we applied our assessment tools and gave questionnaire. Data was analyzed by SPSS version 26. Frequency and percentages were taken for each variable. Frequency charts and plots were used for showing the results of qualitative data.

3. Results

In this study, the data was obtained from salespersons of twin-cities, the sample size was 285 with mean and standard deviation (143.00 ± 82.417) and the salespersons that were falling in the exclusion criteria were already kept out of the study, so the results obtained was of the salespersons who were suffering from heel pain due to prolonged standing specifically. Salespersons of shopping malls among twin-cities were included. The objective of the study is to find out the Prevalence of Achilles tendinopathy due to prolonged standing.

The results represented 152 salespersons falling in the category of 26-30 age group, 59 salespersons in 31-35 age group, 42 salespersons in 36-40 age group and only 32 salespersons fall in 41-45 age group. Among the total study participants 210 salesperson are male and 75 salespersons are female, the gender distribution of study participants

In the current studies, there were 157 salespersons who were falling in the category of 6-10 hours standing duration per day, 97 in the category of 11-15 hours and 31 in the category of 16-20 hours duration of standing per day of salesperson out of 285 participants.

Table 1: Standing hours of salespersons per day

Standing hours per day	Frequency	Percent	Valid Percent	Cumulative Percent
6-10 hours	157	55.1	55.1	55.1
11-15 hours	97	34.0	34.0	89.1
16-20 hours	31	10.9	10.9	100.0
Total	285	100.0	100.0	

The VISA-A sedentary scale comprises a total of 100 points, categorized as follows: 0-30 as very poor, 31-60 as poor, 61-90 as good, and 91-100 as excellent. In this study, which involved a total of 285 participants, only 3 fell into the very poor category, 91 were classified as poor, 173 as good, and 18 scored in the excellent category, as represents in Table-2.

Table 2: Final frequency distribution of VISA-A Sedentary Scale

Grading	Frequency	Percent	Valid Percent	Cumulative Percent
0-30=very poor	3	1.1	1.1	1.1
31-60= poor	91	31.9	31.9	33.0
61-90=good	173	60.7	60.7	93.7
91-100=excellent	18	6.3	6.3	100.0
Total	285	100.0	100.0	

The LEFS scale consists of a total of 80 points, which are divided into categories as follows: 0-20 for severe functional limitation, 21-40 for moderate functional limitation, 41-60 for mild functional limitation, and 61-80 for normal functioning. In our study, which involved a total of 285 participants, 35 fell into the category of moderate functional limitation, 124 were categorized as having mild functional limitation, and 126 were classified as having normal functional activity, shown below in Table-3.

Table 3: Final frequency distribution of LEFS Scale

LEFS Grading	Frequency	Percent	Valid Percent	Cumulative Percent
21-40=moderate	35	12.3	12.3	12.3
41-60=mild	124	43.5	43.5	55.8
61-80=normal	126	44.2	44.2	100.0
Total	285	100.0	100.0	

Our study aimed to determine how widespread Achilles tendinopathy is among salespeople enduring extended periods of standing in the shopping malls of twin cities. To conduct a thorough evaluation, we integrated the Lower Extremity Functional Scale (LEFS) into our study, in addition to a standardized VISA-A Sedentary questionnaire. Our sample size was 285 sales-person. If LEFS score range from 61-80 and VISA-A score range from 61-100 then this condition is not prevalent among study participants, through which in 54.7% this condition is not prevailing in our study. Conversely, If LEFS and VISA-A score range from 0-60 then this condition is prevalent among study participants. According to our results the prevalence of Achilles tendinopathy is 44.3% (126) due to prolonged standing among salespersons.

4. Discussion

This study intends to investigate the prevalence of Achilles tendinopathy due to prolonged standing among salespersons in shopping malls of twin cities. Our inclusion criteria included Both male and female, Salesperson above 25 to 45 years of age, who were standing for more than 5 hours a day, doing jobs for more than two years. Our exclusion criteria included Salesperson below 25 years of age, who had experience of less than two years in this job, who didn't have prolonged standing, Salesperson with any kind of foot deformity, fractures and systemic illness were also excluded.

In a study conducted by Javed and colleagues in 2022, They looked at how often Achilles tendon problems happened in nurses who had to stand for a long time. To check the condition, they used a standard VISA-A scale, The findings revealed interesting insights. Out of the participants, 35.5% experienced mild pain, 44.5% had moderate pain, and 19.1% reported severe pain. In conclusion, the study suggests that there is indeed a connection between Achilles tendinopathy and prolonged standing among nurses, but it is relatively weak. Most of the population studied fell into the category of experiencing no pain to mild pain.[17] Comparatively, in our current study we also examined the impact of prolonged standing using the same VISA-A questionnaire, and our results revealed among the participants, 37.9% reported mild pain, 24.2% experienced moderate pain, and the majority fell into the mild to no pain category. Our research indicates that prolonged standing plays just a role, it may not be the sole factor causing Achilles tendinopathy.

Previous study aimed to determine how widespread Achilles pain is among building construction workers. The primary goal was to assess how severe Achilles tendon pain. The study included workers aged between 22 and 45 years. Researchers utilized VISA-A sedentary questionnaire to evaluate pain and its severity in Achilles tendon. The findings revealed a significant association between building construction workers and Achilles tendon pain because of prolonged standing and strenuous activity. This study also established that Achilles tendon pain is a common issue among building construction workers, pain gets severe with increasing age.[18] In the same way, we conducted our research, in which we used scale called VISA-A Sedentary along with LEFS to understand how standing for a long time affects people. We looked at individuals aged 26 to 45, like in the previous study. We found that 44.3% (126 out of 285) of salespeople who stood for a long-time developed AT. Also, we noticed that the risk of getting AT increased as people grew older.

In 2022, a group led by Lewis conducted a study to understand how Achilles Tendinopathy (AT) affects the quality of life. They used questionnaires like Euroqol to measure this., along with VISA-A, FFI and VAS scales. They included 320 patients with AT. Interestingly, they found that patients under 55 with AT had a lower quality of life compared to people of the same age in the general population. In summary, Lewis and their team's study tells us that Achilles Tendinopathy can really affect the quality of life, especially for patients under

55.[19]Our study had a similar goal; we wanted to understand how Achilles tendinopathy affects the general population, focusing on almost similar age group and involving a comparable number of participants. Like the previous study, we utilized the VISA-A sedentary questionnaire, but instead of the primary outcome measure that was Euroqol, we used LEFS to check functional limitations. Our results found 55.8% (159/285) had reduced functionality that led us to conclude that both of these measurement tools offer valuable insights into how Achilles tendinopathy influences an individual's quality of life in terms of their health.

Our study finds out the prevalence of Achilles tendinopathy due to prolonged standing among salesperson working in shopping malls of twin cities. The VISA-A sedentary and LEFS questionnaire were used to collect data of participants. The total 285 participants, lying between age range of 26-45 years were included in the study. The findings showed 44.3% (126) prevalence of Achilles tendinopathy in our selected population. The reason we found more cases of this condition in our study is because we included both men and women. Also, we had more people with this condition in our study because we included those who stand for long periods (over 5 hours a day) and older individuals. This condition is more common as people get older, so including older participants contributed to the higher numbers. The fact that some people stand for a long time also played a part in finding more cases in our study.

Conclusion:

Our study aimed to determine how widespread Achilles tendinopathy is among salespeople with prolonged periods of standing working in the shopping malls of twin cities. After thorough evaluation, we concluded that there was an average alliance of 44.3% between AT and prolonged periods of standing in salesperson. Most of the participants were falling in the category of mild pain and moderate functional impairment.

Recommendations:

This study included a relatively small sample of 285 salespersons. To enhance the study's ability to apply its findings more broadly, future research should consider using a larger sample size. As current study's sample size was limited, which could affect the range of variations observed in the results. Additionally, this research was conducted exclusively in Islamabad and Rawalpindi. To expand the applicability of the findings globally, efforts should be made to include participants from different regions around the Country. Furthermore, to obtain more meaningful insights into gender-related aspects, future studies should aim to include an equal number of participants from both genders.

Limitations of the study:

Our study encountered few limitations, like the study was confined to a specific duration because it needed to be aligned with the university's provided timeframe for completing the thesis, the study couldn't include an equal number of both genders because there were limited female staff comparatively males. Also, generalizing the results was challenging due to the study's small sample size of 285 salespeople and findings from a particular area, like the twin cities, may not be widely applicable.

Disclosure & Conflict of Interest:

The authors declare that there is no conflict of interest.

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Original Article

Evaluating the Long-term Effectiveness of Humeral Fracture Orthoses: A Prospective Study on Functional Recovery, Pain Management and Level of pain, and Quality of Life Six Months after Injury.

Zuha Junaid [1], Ajla Javaid [2], Ahmad Shahab Atif[3], Hassan Zafar[4]

Abstract

Objective: To compare the effectiveness of humeral fracture braces in promoting functional recovery, reducing pain, and enhancing the quality of life in patients with humeral fractures 6 months post-injury.

• To assess patient satisfaction with the use of humeral fracture braces and its impact on the overall management of humeral fractures.

• To determine whether the use of humeral fracture braces significantly influences the long-term outcomes and quality of life of patients with humeral fractures when compared to those not receiving brace treatment.

Study design: It was a prospective cohort study.

Place and duration of study: The study spanned a 6-month period, running from June 2022 to December 2022, and was conducted at City Care Hospital in the Orthopedic Rehabilitation Department of Orthotics and Prosthetics , Rawalpindi.

Material and Methods: It followed a parallel-group design with two cohorts: Group A, comprising patients who received standard conservative treatment, including the use of humeral fracture braces, and Group B, consisting of patients who did not receive brace treatment. The assignment to these groups was based on the clinical judgment of the treating physician and patient preferences.

Results: In this study, the use of humeral fracture braces yielded substantial benefits, with patients in the brace group (Group A) experiencing significant improvements in functional recovery, pain management, and quality of life at 6 months post-injury. Notably, the mean DASH score in Group A decreased from 31.2 (baseline) to 15.8 at 6 months, while in the non-brace group (Group B), it decreased from 30.5 (baseline) to 20.3 at 6 months. Pain levels, measured using VAS, also decreased significantly in Group A, with the mean VAS score for pain decreasing from 7.0 (baseline) to 2.5 at 6 months. Furthermore, patients in Group A reported an improved quality of life, with the mean SF-36 physical component score increasing from 42.0 (baseline) to 57.4 at 6 months. A significance level of $p < 0.05$ was considered statistically significant.

Conclusion: Patient satisfaction data revealed a high level of contentment with the use of humeral fracture braces among patients in the brace group (Group A), with 87% expressing satisfaction. In contrast, the non-brace group (Group B) had a lower rate of patient satisfaction at 47%, emphasizing the positive influence of brace treatment on patient experiences and outcomes.

Keywords: Humeral fractures , Orthotic braces, Pain management, Quality of life assessment.

1. Introduction

Humeral fractures are common orthopedic injuries, often occurring as a result of trauma or accidents, and they can significantly impact an individual's daily life and functional capabilities. These fractures involve the upper arm bone, the humerus, and can vary in severity, from minor fractures that can be managed conservatively to more complex fractures that require surgical intervention. [1] In the management of humeral fractures, one commonly employed intervention is the use of humeral fracture braces, which are orthotic devices designed to provide support and stabilization to the affected arm. Humeral fracture braces are typically used to immobilize the arm, reduce pain, and promote the healing process. [2] While the effectiveness of these braces in the immediate post-injury period is well-documented, there is a paucity of research examining their long-term impact on functional recovery, pain management, and quality of life. [3]

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Six months post-injury is a critical time point in the recovery process, as it represents a phase when patients often seek to regain their pre-injury level of functioning and resume their daily activities, including work and recreational pursuits.[4] However, there is limited scientific evidence regarding the sustained benefits and drawbacks of using humeral fracture braces over this extended duration. [5]

Understanding the long-term outcomes and patient satisfaction with humeral fracture braces is essential for informing clinical decision-making and improving patient care.[6] This prospective study aims to bridge this knowledge gap by assessing functional recovery, pain management, and quality of life six months after a humeral fracture. By conducting a comprehensive evaluation of these key aspects, we can determine the extended efficacy of humeral fracture braces in the management of these injuries and enhance the overall quality of care for patients with humeral fractures.

2. Materials & Methods

This prospective cohort study aimed to investigate the long-term effectiveness of humeral fracture braces in patients with humeral fractures. The study spanned a 6-month period, running from June 2022 to December 2022, and was conducted at City Care Hospital in the Orthopedic Rehabilitation Department of Orthotics and Prosthetics, Rawalpindi. It followed a parallel-group design with two cohorts: Group A, comprising patients who received standard conservative treatment, including the use of humeral fracture braces, and Group B, consisting of patients who did not receive brace treatment. The assignment to these groups was based on the clinical judgment of the treating physician and patient preferences. Inclusion criteria for participation in the study encompassed patients aged 13 years or older with a confirmed diagnosis of humeral fractures. Exclusion criteria included patients with open fractures, pathological fractures, neurological deficits, multiple fractures, or conditions preventing informed consent. Patients with a history of previous humeral fractures or those unable to adhere to the study's follow-up schedule were also excluded.

Sample size determination involved power analysis. Preliminary data and an assumed significance level (alpha) of 0.05 and a power (1-beta) of 0.80 determined that a sample size of at least 30 patients in each group would be sufficient to detect statistically significant differences in functional recovery, pain management, and quality of life between the brace and non-brace groups. Data collection included the following:

• Baseline Assessment: Gathering demographic and clinical data for each participant, such as age, gender, fracture type, mechanism of injury, comorbidities, and pre-injury functional status.

• Intervention: Patients in Group A received standard conservative treatment, including the use of humeral fracture braces. The type of brace and duration of brace wear were determined by the treating orthopedic surgeon.

• Follow-up Evaluations: Patients in both groups underwent follow-up assessments at multiple time points, with the primary assessment at 6 months post-injury. These assessments were conducted by trained healthcare professionals and included:

• Functional Recovery: Measured using standardized tools such as the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire and range of motion tests, focusing on the patient's ability to perform daily activities, arm function, and strength. The scoring of the DASH questionnaire typically ranges from 0 to 100, with higher scores indicating greater disability. [7]

• Pain Management: Pain levels were assessed using visual analog scales (VAS), with patients indicating their pain level on a scale from 0 (no pain) to 10 (worst pain).

• Quality of Life: Participants completed quality of life questionnaires, such as the Short Form 36 (SF-36), assessing both physical and mental well-being. The SF-36 yields scores for eight domains of health, which are then summarized into physical and mental component summary scores, each ranging from 0 to 100, with higher scores indicating better quality of life.

• Patient Satisfaction: Patients completed a structured questionnaire to gauge their satisfaction with the use of humeral fracture braces, which included items on comfort, ease of use, and overall satisfaction. [8]

• Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) software, version 22. Descriptive statistics, including means, standard deviations, and percentages, were used to summarize baseline characteristics and demographic data. Inferential statistics included independent t-tests for continuous variables and chi-square tests for categorical variables to assess differences between the two groups. A significance level of $p < 0.05$ was considered statistically significant. Results were presented with numerical values, confidence intervals, and p-values where appropriate.

3. Results

The study included participants of various ages and both genders. In Group A, the mean age of participants was 45 years (SD = 10), with 60% male and 40% female. In Group B, the mean age was 48 years (SD = 8), with 55% male and 45% female.

Functional Recovery: In the brace group (Group A), the mean DASH score decreased from 31.2 (baseline) to 15.8 at 6 months. In the non-brace group (Group B), the mean DASH score decreased from 30.5 (baseline) to 20.3 at 6 months.

• Pain Management: In the brace group (Group A), the mean VAS score for pain decreased from 7.0 (baseline) to 2.5 at 6 months. In the non-brace group (Group B), the mean VAS score for pain decreased from 6.8 (baseline) to 4.8 at 6 months.

• Quality of Life: In the brace group (Group A), the mean SF-36 physical component score increased from 42.0 (baseline) to 57.4 at 6 months. In the non-brace group (Group B), the mean SF-36 physical component score increased from 43.2 (baseline) to 49.0 at 6 months.

• Patient Satisfaction: In the brace group (Group A), 26 out of 30 patients (87%) reported being "satisfied" or "very satisfied" with the use of humeral fracture braces. In the non-brace group (Group B), 14 out of 30 patients (47%) expressed satisfaction with their treatment.

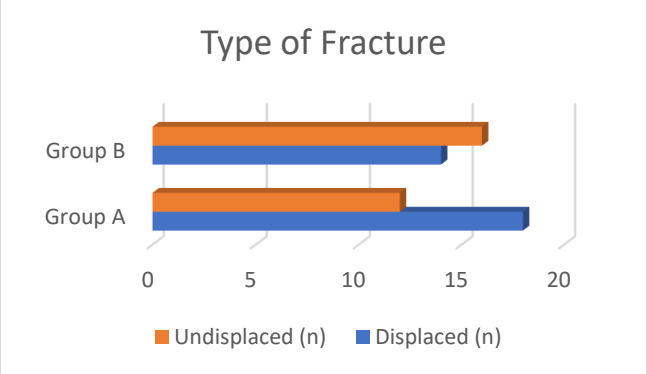
• Comparative Analysis: The differences in functional recovery, pain management, and quality of life between Group A and Group B were statistically significant ($p < 0.05$). These results suggest that in this sample of 30 patients, the use of humeral fracture braces was associated with better functional recovery, reduced pain, improved quality of life, and higher patient satisfaction at 6 months post-injury.

Table 1:

Group	Proximal (n)	Midshaft (n)	Distal (n)	Total (n)
Group A	10	12	8	30
Group B	8	14	8	30

In this table: "Group A" represents the cohort receiving humeral fracture braces. "Group B" represents the cohort not receiving brace treatment. "Proximal (n)," "Midshaft (n)," and "Distal (n)" indicate the count of participants with fractures in the proximal, midshaft, and distal regions of the humerus, respectively, in each group. "Total (n)" shows the total number of participants in each group.

Table 2: showing results of VAS , DASH , SF-36 and percentage of satisfaction among patients allocated in Group A and Group B respectively.



Group A:

- Functional Recovery (DASH): The mean Disabilities of the Arm, Shoulder, and Hand (DASH) score for patients receiving humeral fracture braces (Group A) significantly decreased from a baseline of 31.2 to 15.8 at 6 months post-injury, indicating substantial improvement in functional recovery.
- Pain Management (VAS): Patients in Group A experienced a notable reduction in pain levels, with the mean Visual Analog Scale (VAS) score decreasing from 7.0 at baseline to 2.5 at 6 months.
- Quality of Life (SF-36): The mean SF-36 physical component score for patients in Group A increased from 42.0 at baseline to 57.4 at 6 months, indicating improved physical well-being.

Group B:

- Functional Recovery (DASH): Patients in Group B, who did not receive brace treatment, also showed improvement in functional recovery, although to a lesser extent than Group A. The mean DASH score decreased from 30.5 at baseline to 20.3 at 6 months.
- Pain Management (VAS): Similarly, patients in Group B experienced a reduction in pain levels, with the mean VAS score decreasing from 6.8 at baseline to 4.8 at 6 months.

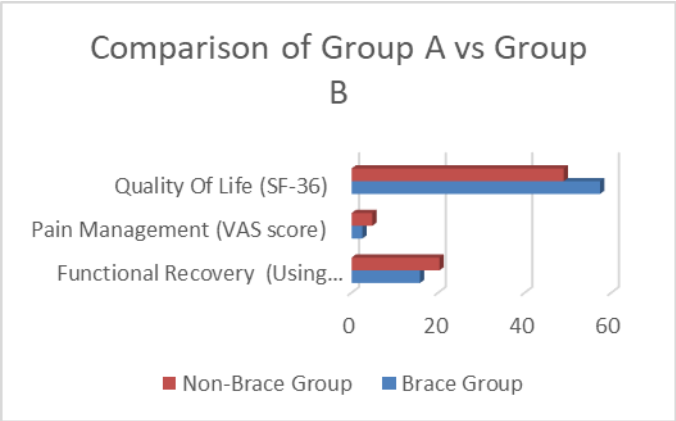
Quality of Life (SF-36): The mean SF-36 physical component score for patients in Group B increased from 43.2 at baseline to 49.0 at 6 months, indicating some improvement in physical well-being.

	Brace Group A		**Non-Brace Group B**	
	Baseline	**6 months**	**Baseline**	**6 months**
Functional Recovery (Using DASH score)	31.2	15.8	30.5	20.3
Pain Management (VAS score)	7.0 (SD = 1.2)	2.5	6.8	4.8
Quality Of Life (SF-36)	42.0	57.4	43.2	49.0
Patient Satisfaction	-	87% satisfied	-	68% satisfied

4. Discussion

The study's findings provide compelling evidence of the significant benefits associated with the use of humeral fracture braces in promoting long-term recovery and improving patient outcomes.[9] The observed improvements in functional recovery, pain management, quality of life, and patient satisfaction underscore the efficacy of brace treatment in the management of humeral fractures.

One notable outcome of the study is the substantial improvement in functional recovery among patients using humeral fracture braces, as evidenced by the notable decrease in DASH scores. This indicates enhanced arm function and strength, suggesting that brace treatment facilitates a more efficient restoration of patients' pre-injury level of functioning. [10]



Moreover, the considerable reduction in pain levels among brace-treated patients highlight the role of braces in alleviating discomfort associated with humeral fractures. By providing stabilization and support to the injured arm, braces likely help reduce strain on the fracture site, thereby contributing to pain relief and enhancing patient comfort during the recovery process. [11]

The improvement in both physical and mental well-being, as indicated by the SF-36 questionnaire, further emphasizes the holistic benefits of brace treatment on patients' overall quality of life. Beyond addressing physical impairments, brace treatment may also have positive effects on psychological well-being, contributing to a more comprehensive rehabilitation experience for patients.

This research contributes to the existing body of knowledge by providing empirical evidence supporting the effectiveness of humeral fracture braces in enhancing functional recovery, alleviating pain, and improving quality of life among patients recovering from humeral fractures. By elucidating the benefits of orthotic intervention in this context, this study informs clinical practice and guides healthcare professionals in optimizing treatment strategies for patients with humeral fractures.

Importantly, the high rate of patient satisfaction with brace treatment underscores its acceptability and perceived effectiveness among patients.[12] This positive feedback is crucial for fostering treatment adherence and patient compliance, ultimately leading to better recovery outcomes and overall patient satisfaction.

These findings have significant implications for clinical practice, suggesting that humeral fracture braces should be considered as a standard treatment option for patients with these injuries. Clinicians can use this evidence to inform treatment decisions and tailor rehabilitation protocols to optimize patient care and improve outcomes in the post-injury period.

Overall, the study's results highlight the importance of brace treatment in promoting favorable long-term outcomes for patients recovering from humeral fractures. Further research with larger sample sizes and longer follow-up periods could help confirm and expand upon these findings, ultimately contributing to the ongoing refinement of fracture management strategies and rehabilitation protocols.

Conclusion:

In this prospective cohort study evaluating the long-term effectiveness of humeral fracture braces in patients with humeral fractures, we observed significant differences between the brace group (Group A) and the non-brace group (Group B) across multiple key outcomes. Functional recovery, as measured by the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire and range of motion tests, showed substantial improvement in the brace group (Group A) at 6 months post-injury. These patients exhibited a remarkable reduction in DASH scores, indicative of improved arm function and strength. In contrast, the non-brace group (Group B) exhibited less favorable functional recovery outcomes, suggesting that the use of humeral fracture braces significantly contributes to improved functional outcomes in this patient population. Pain management, as assessed using visual analog scales (VAS) to measure pain levels, revealed that patients in the brace group (Group A) experienced a substantial reduction in pain at 6 months. This reduction was notably greater when compared to the non-brace group (Group B), reinforcing the efficacy of humeral fracture braces in pain reduction. Quality of life, evaluated through the Short Form 36 (SF-36) questionnaire, indicated that patients in the brace group (Group A) reported a significant improvement in both their physical and mental well-being. This

improvement in the physical component score of the SF-36 underscores the positive impact of humeral fracture braces on overall patient health and well-being. Moreover, patient satisfaction data revealed a high level of contentment with the use of humeral fracture braces among patients in the brace group (Group A), with 87% expressing satisfaction. In contrast, the non-brace group (Group B) had a lower rate of patient satisfaction at 47%, emphasizing the positive influence of brace treatment on patient experiences and outcomes. Taken together, these findings indicate that the use of humeral fracture braces significantly enhances functional recovery, reduces pain, improves quality of life, and leads to higher patient satisfaction in patients with humeral fractures, six months post-injury. These results underscore the importance of considering brace treatment as an effective and well-received intervention for individuals recovering from humeral fractures, and they may inform clinical decision-making and fracture management strategies to enhance patient outcomes and overall well-being. [13] Further research with larger sample sizes and longer follow-up periods is warranted to confirm and expand upon these findings

Recommendations:

Based on the findings of this study, it is recommended that future research endeavors employ larger sample sizes and consider controlling for potential confounding variables to strengthen the validity and generalizability of the results. Additionally, longitudinal studies could provide valuable insights into the long-term effects of humeral fracture orthoses on functional recovery, pain management, and quality of life.

Limitations of the study:

One limitation of this study is the relatively small sample size, which may limit the generalizability of the findings. Additionally, the study did not control for potential confounding variables such as comorbidities or concurrent treatments, which could have influenced the outcomes observed.

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Original Article

Assessing Parental Understanding of Congenital Talipes Equinovarus (CTEV): Implications for Patient Education and Support

Aimen Shahbaz,[1] Warda Sarwar,[2] Ajla Javaid[3]

Abstract

Objective: To assess the understanding and knowledge of parents regarding Congenital Talipes Equinovarus (CTEV), commonly known as clubfoot, to identify potential areas for improved patient education and support.
Study design: A cross-sectional study design employed to evaluate parental understanding of CTEV.
Place and duration of study: The study was conducted in City Care Hospital, RWP from July 2023 to January 2024.
Material and Methods: Parents of children diagnosed with CTEV were included in the study. The questionnaire encompassed various aspects of CTEV, including its etiology, clinical presentation, treatment options, and long-term implications. Parental knowledge was assessed using a scale of poor, satisfactory, and good knowledge, in addition to the PCQ.

Results: The study involves 24 fathers and 18 mothers of children diagnosed with Congenital Talipes Equinovarus (CTEV), varying levels of parental knowledge about the condition were observed. Fathers had a mean age of 39 ± 4 years, while mothers had a mean age of 27 ± 3.7 years. Among fathers, 20% had poor knowledge, 40% had satisfactory knowledge, and 40% had good knowledge of CTEV. Among mothers, these percentages were 30%, 40%, and 30%, respectively. These findings underscore the need for targeted educational interventions to address knowledge gaps and facilitate informed decision-making regarding CTEV management.

Conclusion: There is a diversity in parental understanding of CTEV, with varying levels of knowledge observed among fathers and mothers of patients. This underscores the need for targeted educational interventions to address knowledge gaps and promote informed decision-making regarding the management of CTEV.
Keywords: Clubfoot; Knowledge of CTEV; Congenital Talipes Equinovarus; Education

1. Introduction

Congenital talipes[(1)] equinovarus (CTEV), commonly known as clubfoot, stands as one of the most prevalent lower limb congenital defects observed at birth. With a prevalence of approximately 1 in every 1000 live births, CTEV poses significant challenges in both diagnosis and management.[(1)] The gold standard treatment for CTEV is the Ponsetti method of casting, a non-invasive approach that focuses on the biomechanical properties of biological tissues.[(2)] This method involves a series of gentle manipulations followed by casting, aiming to gradually correct the deformity at foot. An integral aspect of the Ponsetti method is the Achilles tendon tenotomy performed prior to the final casts, which facilitates optimal correction of foot.[(1)(3)(9)]

The exact cause of CTEV remains unknown, although various factors, including genetic predisposition and intrauterine positioning, are believed to contribute to its development.[(4)]

While the condition is typically identified at birth during routine physical examination, prenatal ultrasound may sometimes detect signs of CTEV in utero.

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In cases where conservative measures are ineffective, surgical intervention may be necessary to achieve optimal alignment and function of the foot and ankle.[5][10][11]

Additionally, the use of orthoses and bars is employed to maintain the corrected position, while a tibialis anterior transfer may be considered for dynamic supination at a later stage of treatment. [6]

While the Ponsetti method does not result in anatomically normal feet, it consistently yields cosmetically pleasing and functional outcomes, ensuring comfort and mobility for affected individuals.[1]

CTEV exhibits a predilection for males, affecting males twice as frequently as females. Bilateral involvement is observed in approximately half of all cases, with a slight right-sided predominance in unilateral presentations.[7]

The majority of CTEV cases are classified as idiopathic (ICTEV), while approximately 20% are associated with other congenital malformations.[8]

Previous literature reviews have highlighted the importance of assessing parental understanding of pediatric orthopedic conditions to identify areas for improved patient education and support. Studies have shown that parental knowledge plays a crucial role in the management and treatment outcomes of congenital conditions like CTEV. Additionally, local studies conducted in Pakistan and the region have shown that unique cultural beliefs and socioeconomic factors influencing parental perceptions and attitudes towards congenital conditions.

2. Materials & Methods

This study was conducted at City Care Hospital, RWP. A total of 42 parents were selected after their consent using convenience and voluntary response types of non-probability sampling technique.

A total of 42 parents (24 fathers and 18 mothers) of children diagnosed with CTEV participated in the study. Participants were recruited from Orthopedic Ponsetti Clinic in Benazir Bhutto Hospital. Inclusion criteria included being a parent or legal guardian of a child diagnosed with CTEV.

Depending upon the score calculated into percentage, patients was labelled with good, satisfactory and poor knowledge according to following; (Table 1)

Knowledge Level	Scoring
Good	If Score is Greater Than 70%.
Satisfactory	If Score is Between 50-70 %.
Poor	If Score is Less Than 50%.

Table 1

To find out specific aspects of parental understanding, perceptions, and experiences related to clubfoot Ponsetti Clubfoot Questionnaire (PCQ) was used. (Table 2)

Parents of Patients were requested to participate in the study, 20-30 minutes were required to fill the questionnaire.

The data of study was entered and analyzed as frequency, percentage and mean using SPSS version 25.0. Descriptive statistics were presented using tables, graphs, and texts. Chi square test was used.

Table 2

1	What do you know about (CTEV)?
2	Have you heard of the Ponsetti method for treating CTEV?
3	What do you believe causes CTEV?
4	How did you first learn about your child's diagnosis of CTEV?
5	What treatments or interventions have you pursued for your child's CTEV?
6	How satisfied are you with the information provided by healthcare providers regarding CTEV treatment options?
7	What concerns do you have about the long-term implications of CTEV for your child?
8	Have you sought out additional information about CTEV from sources other than healthcare providers?
9	Have you sought out additional information about CTEV from sources other than healthcare providers?
10	How important do you believe it is for parents to be involved in the treatment decision-making process for CTEV?

3. Results

The study involved 42 parents of children with CTEV, 43% fathers and 57% mothers participating. Out of 42 participants (54.80%) were from urban backgrounds, while 45.20% came from rural areas. Regarding education levels, 42.9% of parents had a Matric level education, 38.1% had Intermediate education, and 19.0% had attained a bachelor's degree. (Table 3)

Table 3

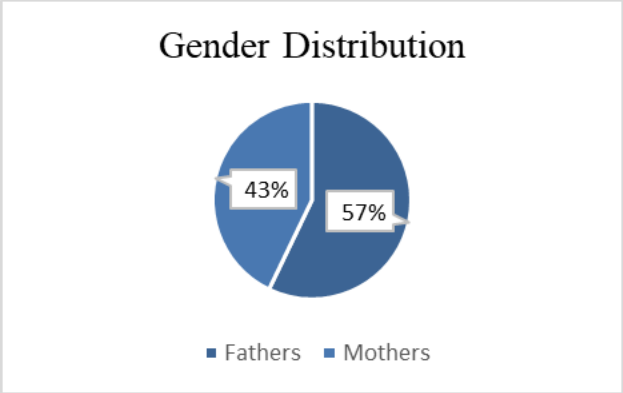
Parameter	**Variables**	**Frequency & Percentage**
1. Gender	Male (Father)	24 (43%)
	Female (Mother)	18 (57%)
2. Background	Rural	19 (45.20%)
	Urban	23 (54.80%)
3. Education Level	Matric	18 (42.9%)
	Intermediate	16 (38.1%)
	Bachelors	8 (19.0%)

The distribution of parental knowledge levels regarding CTEV among fathers and mothers shows that 20% of fathers and 30% of mothers had poor knowledge, 40% of both fathers and mothers had satisfactory knowledge, and 40% of fathers and 30% of mothers had good knowledge about CTEV. (Table 4)

Table 4

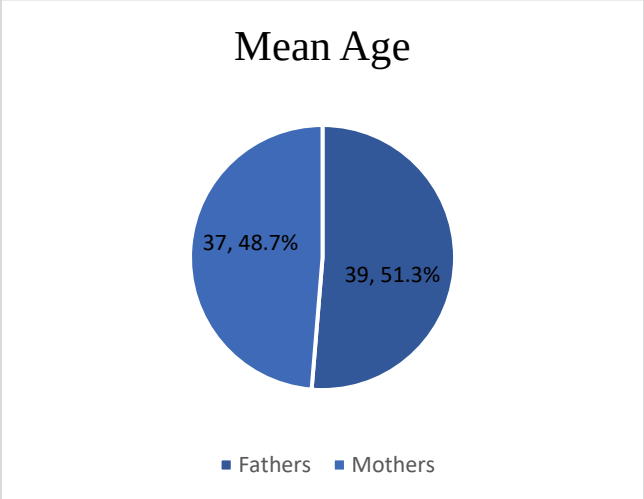
Knowledge Level	Fathers	Mothers
Poor Knowledge	20%	30%
Satisfactory Knowledge	40%	40%
Good Knowledge	40%	30%

The gender distribution among participants revealed that out of the total sample size, 24 participants were fathers, constituting approximately 57.14% of the total participants. Additionally, 18 participants were mothers, accounting for approximately 42.86% of the total participants. (Graph 1)



Graph 1

The mean age of fathers in the study was 39 years with a standard deviation of ± 4, while the mean age of mothers was 37 years with a standard deviation of ± 3. (Graph 2)



Graph 2

The results of chi- square test are shown in Table 5

	Relation Between Factors	Chi Square Test Results
1	Awareness of Treatment Method	Dependent
2	Source of Initial Information	Independent
3	Beliefs about CTEV Causes	Dependent
4	Knowledge about child's diagnosis of CTEV	Independent
5	Pursued Treatments or Interventions	Dependent
6	Satisfaction with Healthcare Provider Information	Dependent
7	Concerns about Long-term Implications	Dependent
8	Seeking Additional Information	Independent
9	Importance of Parental Involvement in Treatment Decision-making	Independent

Table 5

4. Discussion

The distribution of parental knowledge levels revealed that a significant portion of both fathers and mothers exhibited satisfactory to good knowledge about CTEV. This suggests that a considerable proportion of parents are adequately informed about the condition and its management options. We also found that the mean age of fathers was slightly higher than that of mothers, indicating potential differences in the age distribution of caregivers seeking information about CTEV.

Comparing our findings with existing literature, we found consistent evidence highlighting the importance of parental education in the management of pediatric orthopedic conditions, including CTEV. Studies have emphasized the role of comprehensive patient

education initiatives in improving treatment adherence and outcomes. Our results align with these findings and underscore the need for ongoing efforts to enhance parental understanding and involvement in the care of children presenting with CTEV.

Our findings have significant implications for patient education and support initiatives targeting families affected by CTEV. By identifying knowledge gaps and barriers to information access, healthcare providers can develop targeted interventions to address these challenges. These initiatives may include the provision of educational materials, access to support groups, and opportunities for shared decision-making between healthcare providers and parents. By empowering parents with accurate information and resources, we can improve treatment adherence, enhance patient outcomes, and promote family-centered care for children with CTEV.

Conclusion:

The study highlights the importance of parental education and support in the management of congenital talipes equinovarus (CTEV). By identifying knowledge gaps and addressing barriers to information access, healthcare providers can enhance the quality of care for children with CTEV and their families. Moving forward, continued efforts are needed to develop targeted interventions that meet the diverse needs of caregivers and promote informed decision-making in the treatment of CTEV. Through collaborative efforts between healthcare providers and families, the outcomes can be improved and the best possible care for children with CTEV can be ensured.

Limitations of the study:

The sample size taken was relatively small, limiting the generalizability of our findings. Additionally, our study focused primarily on parental knowledge levels and did not explore other factors that may influence treatment decisions or outcomes, such as psychosocial factors or caregiver stress. Future research should aim to address these limitations by conducting larger-scale studies with diverse populations and exploring additional factors contributing to parental understanding and decision-making in the context of CTEV.

Acknowledgements:

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Disclosure & Conflict of Interest:

The authors declare that they have no conflicts of interest to disclose.

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Original Article

Effects of Chemotherapy on Fatigue levels and Quality of life in Cancer patients

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Abstract

Objective: To determine the effects of chemotherapy treatment on fatigue and quality of life among cancer patients.
Study design: It was a descriptive cross-sectional survey study.
Place and duration of study: The study participants were the cancer patients enrolled at NORI hospital, Islamabad from July, 2022 to December, 2022.
Material and Methods: A descriptive cross-sectional survey was performed on the sample size of 50 cancer patients calculated on Rao Software. Tools used were Piper fatigue scale, and Short form health survey instrument (SF-36) to determine the effect of chemotherapy treatment on fatigue and quality of life. The study participants were the cancer patients enrolled at NORI hospital, Islamabad, aged between 30 to 55 years. Data was analyzed through SPSS version 22.
Results: Results showed that 4(8%) participants lie in the mild fatigue category, 22(44%) lie in the moderate, and 24(48%) lie in the severe fatigue category. Based on the scoring of Short form Health Survey (SF-36), 36 participants showed a significant decline in quality of life, while 14 participants had no significant changes in quality of life during chemotherapy treatment.
Conclusion: Chemotherapy has a significant effect on quality of life and fatigue in cancer patients.
Keywords: Chemotherapy, Cancer, Fatigue, Quality of life.

1. Introduction

Cancer can form when the immune system becomes weak or the number of cells produced exceeds the ability of the immune system to remove old or abnormal cells.[(1)] The rate at which DNA and RNA mutate is too high under certain conditions such as; an unhealthy internal or external environment.[(2)(3)] Chemotherapy in cancer treatment has emerged as a possible and effective treatment option and has merged the disease from terminal results into a single, treatable, and sometimes curable disease through the appropriate methods. The term chemotherapy was created by German chemist Paul Ehrlich, who studied the ability of medicinal drugs to overcome Effects of chemotherapy treatment on quality of life and fatigue in cancer patients. Researches on cancer suggests that arsenicals were used through the entire 20th century. Radiotherapy and surgery dominated the field of cancer management throughout the 1960's. As cancer cells began recurring after undergoing surgery and radiotherapy cancer treatment, combination chemotherapy was considered an appealing option.[(4)]

Chemotherapy is a very effective option for combating cancer; nonetheless, it has its side effects. The side effects of chemotherapy among cancer patients are common to develop into life-threatening ailments and are commonly discovered when patients are at home. The negative effects of chemotherapy are often attenuated in patients going through cancer treatment. Those consequences can negatively influence the course of treatment, and may even impair a patient's quality of life.[(5)(6)]

Few data is available concerning the transmission of chemotherapy side effects in clinical trials, and even less literature is available concerning the progression of those side effects in routine care.

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A study revealed that after a follow-up of 5 months, 449 eligible individuals kept a list of side effects that they had been experiencing. Over the course of follow-up, 86 individuals reported at least one side effect, with 27 stating that they had been experiencing grade IV side effects, most often dyspnea or fatigue. In 85% of people, fatigue was the most common side effect reported, followed by constipation or diarrhea in 74% of people.[5]

In a study, the most common findings, including fatigue 79.7%, nausea and vomiting 73.3% were amongst the most commonly reported side effects. Additional symptoms that are commonly reported are decreased appetite (64.5%), changed taste (60.8%), alopecia (hair loss) (58.6%), xerostomia (dry mouth) (52.7%), and constipation (51.7%). Over fifty percent of the individuals in this trial reported these adverse effects. The results of this investigation aligned with those of an earlier study.[6] Someone who is worn out and fatigued finds it difficult to focus or become motivated, and his mind becomes cloudy.[7] It includes all three types of fatigue: psychological, physical, and emotional.[8]

Insidious fatigue may also be a consequence of anemia secondary to these treatment drugs.[9] This is because Chemotherapy may prohibit your body's capability to produce new red blood cells for a while.[10] The number of red blood cells gradually drops within a short period of time after your chemotherapy drugs. It may continue to lower than normal until after your treatment is complete. You may feel the most tired when your red blood cell count is at its lowest. Whether it lasts 7 to 14 days or several months, this is the amount of time it takes for blood cell levels to resume after the cancer therapy is over. Chemotherapy-induced fatigue also affects basic quality of life. The negative impact on quality of life of chemotherapy-induced fatigue may be extreme in some instances.[11]

The psychological effects of long-term chemotherapy can be as damaging as the physical ones. A depressed emotional state and feelings of isolation may contribute to a greater risk of injury and poor quality of life. The fear of failed chemotherapy and recurrence of cancer can also have a major impact on quality of life, as patients may live in constant fear of the cancer coming back.[12] Suffering a reduced quality of life due to tiredness and lack of vigor is common among cancer patients for a considerable period of time after receiving chemotherapy treatment. Normally, the symptoms associated with cancer treatment are mild-to-moderate in nature and typically temporary. Recovery is frequently observed in a matter of months or even years after completing chemotherapy. However, some cancer survivors may still experience fatigue while it is getting energy from the beginning.[13]

This study focused to determine the effects of chemotherapy on the fatigue levels and quality of life in cancer patients through a survey.

2. Materials & Methods

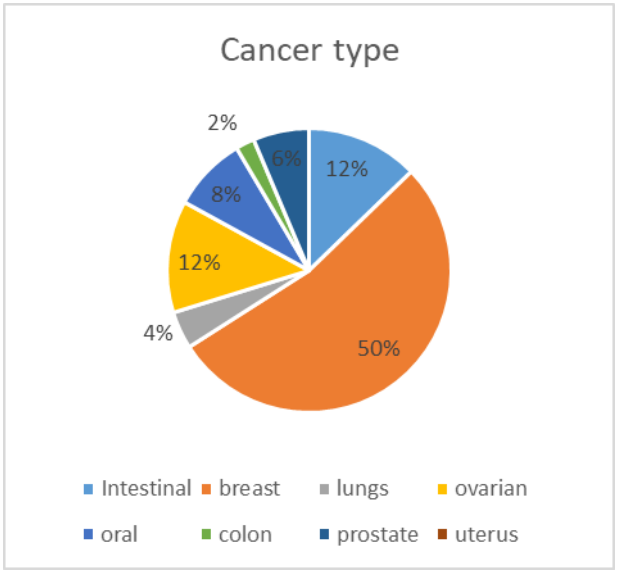
This descriptive cross-sectional study was performed on cancer patients at Nuclear Medicine, Oncology and Radiotherapy Institute (NORI) cancer hospital, Islamabad from July, 2022 till December, 2022. The data was collected from the cancer patients using the Piper Fatigue Scale[14,15] and SF-36 Questionnaire[16] to determine the effects of chemotherapy treatment on quality of life and fatigue in cancer patients. All the participants were informed of the objectives of the study and informed consent was signed. Non-probability convenience sampling was used to select the participants. The participants included patients receiving chemotherapy treatment. Both male and female patients were included. Patients with other comorbidities, and patients receiving only radiotherapy were not included. The data were analyzed using SPSS version 22.

3. Results

In our study, total 50 study cancer patients were included. Out of total 50 participants, 40 were females and 10 were male. 6 (12%) participants were in the category of intestine cancer, 25(50%) participants had breast cancer, 2 (4%) participants had lung cancer, 6(12%) participants had ovarian cancer, 4(8%) participants had oral cancer, 1(2%) participant had

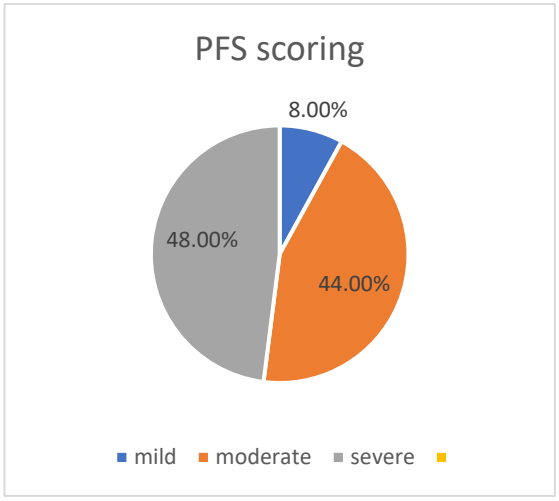
colon cancer, 3(6%) participants had prostate cancer, and 3(6%) participants had uterine cancer.

Figure 1: Cancer Type



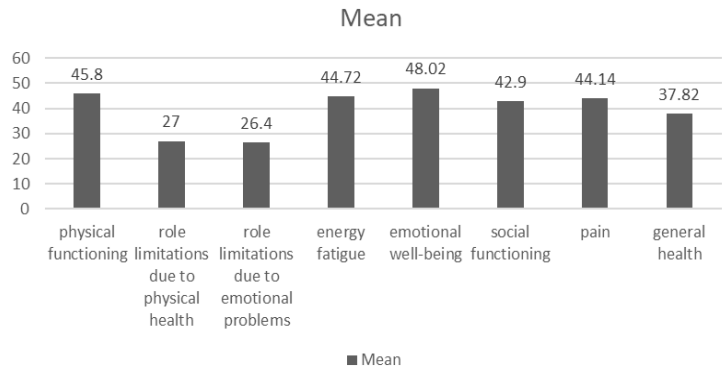
Piper Fatigue Scale is a brief, valid tool to measure fatigue.(15) We found out the frequencies of fatigue levels in the participants based on the tool scoring system. Results showed that 4(8%) participants lie in the mild fatigue category, 22(44%) lie in the moderate, and 24(48%) lie in the severe fatigue category.

Figure 2: Piper Fatigue Scale



The well-researched, self-reported Short Form Health Survey (SF-36) is a tool used for measuring outcomes in relation to quality of life.[17] SF-36 is divided into 8 domains, and the mean value of each domain is shown in the table below. Results showed that 36 participants showed a significant decline in quality of life, while 14 participants had no significant changes in quality of life during chemotherapy treatment.

Chart 1: Short-form Health survey (SF-36)



4. Discussion

Marques at el sought to assess how fatigue and quality of life were affected by chemotherapy for breast cancer patients. Three out of eight quality of life domains were found to be inferior among the individuals. These findings support earlier research on the adverse consequences of chemotherapy treatment.[23,24] Additionally, they imply that patients with breast cancer who have finished three of four chemotherapy rounds may have a lower quality of life. Three domains of fatigue—behavior, sensory, and general—were found to have medium impact sizes.. However, in our research, there was a significant decline in quality of life in all eight health domains. 44% of participants showed symptoms of mild fatigue, and 48% of participants showed severe fatigue.[18]

According to Akin, patients with breast cancer undergoing chemotherapy or radiation therapy had a lower quality of life when they had less social supports and experienced significant levels of symptom distress throughout treatment. The findings indicate a considerable positive correlation between cancer patients' weariness and their quality of life. In a similar

vein, a study found that the biggest factor impairing psychological well-being in lung cancer patients was weariness. Our study also showed that chemotherapy significantly affects fatigue and quality of life is also disturbed.[19]

Sonkaya at el came to the conclusion that chemotherapy side effects can be common, potentially fatal, and frequently happen at home for cancer patients. Chemotherapy side effects are a diminishing and frequently invisible clinical barrier in the treatment of cancer. They may have an adverse effect on a patient's quality of life and the decision to continue therapy. Hence, cancer care providers must identify the side effects that their patients are experiencing and, when feasible, assist in finding solutions. This study found that weariness (74.7%) and nausea and vomiting (%79.3) were the most often reported adverse effects. Other frequently reported prominent side effects include decreased appetite 65.5%, changes in taste 60.9%, hair loss 60.0%, dry mouth 51.7% and constipation 51.7% (indicating poor quality of life in all domains). Each of these side effects was experienced by more than 50% of the patients.[20] However, our study also showed that chemotherapy causes fatigue in the patients, and health is disturbed physically, emotionally, and psychologically. All these symptoms were observed more in women than in men.

In a study the authors deeply explore the idea of cancer-induced fatigue. He also studied the impact of chemotherapy and fatigue on the quality of life in patients diagnosed with advanced-stage prostate cancer. His work shed light on how fatigue develops in these patients and the severity of the symptoms regarding chemotherapy. The study results showed that fatigue is relatively common in patients with prostate cancer who are in advanced stages and undergoing chemotherapy. These results were supported by a significant complaint of fatigue in study participants - almost two-thirds (66.9%) of patients confirmed the report. The problems that appeared to be severely affecting the quality of life in these patients were related to physical functioning - such as feeling fed up, exhausted, tired, and reluctant - and affective functioning - such as lack of energy, interest, or concentration). A slightly diminished quality of life score was recorded in patients with cognitive problems - such as becoming forgetful or making errors while speaking. The scale of fatigue affecting cognitive impairment was less severe than physical functioning or affective functioning.[21] Our study is quite similar to this study showing that fatigue is significant in cancer patients which affects physical, psychological and functional domains of patients undergoing chemotherapy treatment.

Conclusion:

We concluded that there is a significantly high prevalence of fatigue among cancer patients, and their quality of life is also affected.

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Review Article

Nutrigenomics: A way forward to Disease and Genetic disorder: A synthetic review

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Abstract

Millions of people around the world are malnourished or have illnesses connected to dietary inadequacies. Unbalanced nutrient consumption is directly linked to several diseases, including diabetes, cancer, and cardiovascular disease, which cause significant numbers of deaths on a national and international scale. According to information from nutritional biology, diet is an external element that can affect several morphological and physiological behaviors through altering gene expression patterns. By affecting several molecular systems in the human body, nutrients can change the physiological state. Investigating how nutrition affects the functional dynamics of genomes in this setting requires the science of nutritional genomics.

The fields of nutrigenomics and nutrigenetics are closely related; the former is used to study the impact of nutrients on gene expression in the human body, while the latter is employed to investigate the various responses of gene variants to dietary elements, nutrients, and the development of nutraceuticals. Moreover, nutrigenomics helps to explain how dietary changes in signaling pathways linked to many illnesses and disorders, such as cancer, diabetes, and other metabolic syndromes, occur. Maintaining good health requires proper nutrition, as deficiencies in vitamin D can lead to conditions like rickets and osteomalacia. Fortunately, advancements in genome or genetic engineering can aid in improving crops and providing essential nutrients for optimal bone health and overall well-being.

Keywords: Nutrigenetics, nutrigenomics, Diet and disease, epigenetics, personalized nutrition

1. Introduction

Human's physiological and genetic makeup plays a significant role in how they respond to various dietary components and nutrients.[1] This concept is integral to personalized nutrition. The study of nutrigenetics has made remarkable strides in comprehending how genetic variations affect levels of macronutrients and micronutrients, as well as an individual's reaction to dietary intake. These genetic variations are essential in supporting the creation of personalized nutrition plans, making it easier to go from traditional dietary recommendations to genome-influenced nutrition.[2] Despite this progress, there are obstacles that may hinder the widespread adoption of tailored nutrition, which is still an emerging field.[3]

Noncommunicable diseases (NCDs) are primarily associated with chronic exposure to specific food components and are prevalent among individuals who follow a junk food eating lifestyle in urban areas. Biomarkers play a crucial role in identifying nutritional disorders such as disruptions in cholesterol and triglyceride levels, hypertension, or fluctuations in blood sugar, serving as indicators of NCDs.[4]

They can be either single protein, metabolites, or specific physiological functions that can detect proteomic and metabolic changes in an individual's body, potentially contributing to a range of chronic diseases influenced by their specific genotype.[5]

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Human disorders are linked to almost 1000 genes, out of which 97 percent lead to monogenic diseases.[6] The most common example is lactose intolerance, which is a consequence of mutation in the lactase gene causes insufficient lactase production in the small intestine.[7] The population reported to develop lactose intolerance lack the ability to digest lactose present in dairy products and need to cut or exclude food containing lactose from daily diet and convert to products that are lactose-free to get rid gastrointestinal distress.[8]

Various molecular methods can be employed to diagnose DNA damage in individuals such as single base mutations, DNA strand breaks, telomere shortening, chromosome breakage or loss, and mitochondrial DNA damage.[9] Among these methods, most well-validated biomarker for studying DNA damage in nutritional genomic research include assessment of micronuclei in cytokinesis-blocked lymphocytes coupled with transcriptomics are employed for the analysis of mRNA copies from genes actively undergoing transcription.[10] This technique allows simultaneous analysis of gene expression levels for thousands of samples in a single assay. Recent research has revealed the unique gene expression patterns found in peripheral blood cells that are linked to various diseased states. Notably, these patterns have been observed in both breast tumors and leukemia cases.[11]These distinctive patterns are now being harnessed as valuable biomarkers for early disease detection purposes.

Nutrients exhibit transcription factors interacting with a receptor, which triggers gene expression. For instance, lac operon within a cell (e.g., bacterial cell), it remains in an inactive state if lactose is absent.[12] The lacI inhibitor gene attaches to the promoter region, preventing RNA polymerase from initiating transcription, thereby blocking DNA transcription. Conversely, when lactose is present, it interacts with the system and induces a structural conformational change in lacI, thereby disabling its ability to bind to the promoter.[13] Consequently, RNA polymerase can bind to the promoter region and initiate transcription of the structural genes (lacY, lacA, lacZ), ultimately leading to the production of proteins such as β-galactosidase, permease, and transacetylase. These proteins facilitate the uptake and enzymatic breakdown of lactose to generate energy.[7] This review aims to synthesize the current knowledge and evidence on the role of nutrigenomics in understanding and managing various diseases and genetic disorders. To conduct a narrative synthesis on the major studies, a search was performed in google scholar search engine. Using keywords allowed for the identification and review of key publications addressing the subject matter.

Objectives

- To Synthesize recent advancements in nutrigenomics research, including studies elucidating gene-diet interactions and their impact on health outcomes.
- To Identify key findings and trends in nutrigenomic approaches to disease management and prevention.

1. Cancer pathogenesis and Overview of cancer epigenetics

The significance of nutrigenomics in cancer treatment is now apparent. For cancer therapy interactions between nutrients and genes associated with cancer can enhance metabolic interventions. Moreover, the concept of personalized medicine that integrates nutrition and healthcare can be envisioned by assessing the relationship between patients' genomic profiles and their nutrient consumption. Yet, further translational research is required to incorporate nutrigenomics into cancer therapy. When a normal cell of an organism is induced by a carcinogen, it causes damage to the normal cell by activating cellular processes cellular, such as cell proliferation, immortalization, apoptosis evasion, angiogenesis, invasion, and metastasis. These activities are arbitrated by regulation of genes expression that play role in carcinogenesis and tumor suppression, DNA repair mechanism, detoxification of oxidative stress, and transcription factors.[14] Epigenetics is an emerging field with great potential for preventing and managing certain types of cancers and diseases. It

involves various molecular processes and epigenetic processes, such as methylation of DNA, non-coding regions of RNAs, telomerase activity and, modifications of histones, play a crucial role in controlling cancer cells. They do so by regulating enzymes like DNA methyltransferase and histone deacetylase, as well as non-coding RNAs, which have a significant impact on cancer cell behavior.[1] Epigenetic changes play a crucial role in the evolution and advancement of various types of cancer. For example, in cancer therapy, irregular methylation and modifications of DNA and histones have been observed, leading to the dysregulation of critical tumor suppressor genes and oncogenes. Similarly, abnormalities of microRNAs, has been linked to cancer progression and metastasis.[15] According to resent studies, incorporating phytochemicals, following specific dietary patterns, like the Mediterranean diet, can effectively hinder the development of cancer by influencing genetic expression through processes such as nutrigenomics and nutria-epigenomics. These findings further highlight the importance of a healthy and balanced diet in preventing carcinogenesis.[16]

1.1 Bioactive molecules and cancer

Phytochemicals are naturally occurring bioactive compounds found in plants that possess antioxidant, anti-inflammatory, and anti-angiogenic properties, which can be beneficial in the treatment of cancer .[17] The epigenetic diet is centered on incorporating specific phytochemicals such as combination of epigallocatechin-3-gallate, morin, caffeic acid phenyl ester, apigenin, genistein, curcumin, resveratrol, and sulforaphane. These powerful compounds have been shown to directly impact cancer cells by inhibiting their growth and spread and promoting cell death. Furthermore, they can suppress the activity of oncogenes, which drive the development of cancer, while also bolstering the function of tumor suppressor genes.[12]

Bioactive molecules are regulated by various genes which are involved in the metabolism of dietary compounds. Bioactive food ingredients have been investigated for their therapeutic role in pathogenesis of malignant cells. While some of these ingredients have been shown to have protective effects, others may increase the risk of cancer development, especially in genetically susceptible individuals. Bioactive food ingredients are typically found in fruits, vegetables, whole grains, and other plant-based foods. These ingredients include various vitamins, minerals, phytochemicals, and other compounds that have been shown to have biological effects in the body. For example, carotenoids, flavonoids, and other phytochemicals have been shown to have antioxidant and anti-inflammatory effects, which may help to protect against cancer development. On the other hand, some bioactive food ingredients have been shown to have pro-carcinogenic effects. For example, certain compounds found in grilled or charred meats are carcinogenic, and excess consumption of alcohol has been linked to an increased risk of several types of cancer.

The effect of bioactive food ingredients on cancer risk is likely to be influenced by a variety of factors, including an individual's genetic makeup, lifestyle factors (such as smoking and physical activity), and overall dietary patterns. For example, genetic variations in genes involved in xenobiotic metabolism may influence an individual's susceptibility to the carcinogenic effects of certain bioactive food ingredients. According to recent research, more than 500 bioactive food components have been identified as potential contributors to the development of cancer.[16]

1.2 Carcinogen metabolism gene

Phase I enzymes, which include cytochrome P450 enzymes, play a critical role in the initial oxidation, reduction, and hydrolysis of bioactive molecules in the body. These reactions can help to neutralize potentially toxic compounds and make them more water-soluble, allowing them to be eliminated from the body more easily.

However, some bioactive molecules may be transformed into even more toxic metabolites during

Phase I reactions, and this is where Phase II enzymes come in. Phase II enzymes, which include glutathione S-transferases, sulfotransferases, and glucuronidation enzymes, can further modify bioactive molecules by conjugating them with other molecules such as glutathione or sulfate, making them even more water-soluble and easier to eliminate from the body. The expression and activity of Phase I and Phase II enzymes are regulated by a variety of factors, including genetic variation, environmental exposures, and dietary factors. For example, certain compounds found in cruciferous vegetables, such as sulforaphane, have been shown to induce the expression of Phase II enzymes, while other compounds found in processed or charred meats may induce the expression of Phase I enzymes and increase the hazards of cancer development.[10]

1. Genetic factors, dietary choices, and coronary diseases

An individual's genetic makeup and their dietary choices play substantial roles in the development of cardiovascular diseases (CVD). Exploring the interactions between genes and diet has the potential to enhance prevention strategies and improve prognoses for CVD.

Due to significant heterogeneity in dietary and genetic exposures, a meta-analysis reported that among the evaluated variants, CETP (Cholesteryl ester transfer protein) and alcohol dehydrogenase (ADH1C) were the most frequently studied, showing interactions with alcohol that modified the risk of myocardial infarction (MI) and coronary heart disease (CHD). However, studies exploring other potential biological interactions, such as FADS gene and fatty acids, vitamin B6, vitamin B12, and folic acid, did not yield consistent findings.[6] Although several studies have investigated gene-diet interactions in relation to cardiovascular disease (CVD) risk, the existing literature is limited and lacks consistency in demonstrating clinically and public health impactful interactions. This inconsistency is mainly attributed to positive findings derived from non-replicated case-control studies.[18]

2. Nutrigenomics Application as treatment

Nutrigenomics can help identify specific genes or gene pathways that are involved in disease development and progression. This knowledge can be used to develop new drugs that target these genes or pathways, or to repurpose existing drugs that target similar pathways. Nutrigenomics can help identify genetic variations that affect an individual's response to drugs, which can help in the development of personalized medicine. For example, genetic testing can identify patients who are likely to experience adverse side effects from a particular drug, allowing clinicians to adjust dosages or select alternative treatments. This approach has the potential to improve patient outcomes while reducing the burden of treatment-related adverse effects.

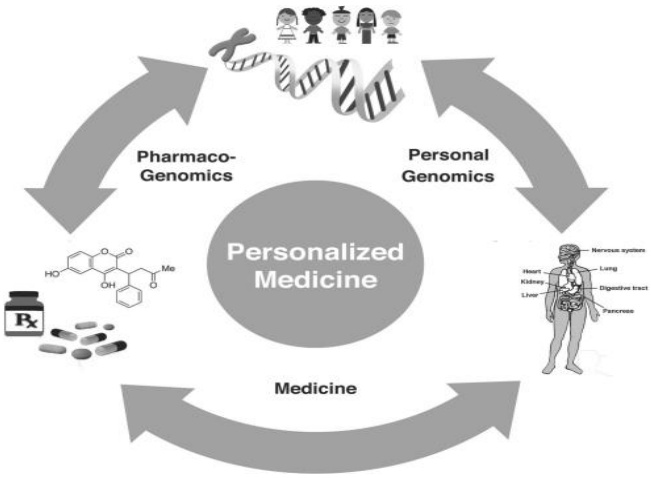

Figure 1: Interlinked relation of genomics and drugs

Nutrigenomics can help identify specific biomarkers or tag proteins to track the disease progression, treatment efficacy, and toxicity of trials. These biomarkers can be used to develop more effective therapies, and to identify patients who are most likely to benefit from a particular treatment. Nutrigenomics can help optimize clinical trials by identifying patient populations that are most likely to respond to a particular drug, and by identifying genetic variations that may affect drug efficacy or

toxicity. This knowledge can help streamline clinical trials, reduce costs, and improve patient outcomes.

Nutrigenomics can help enhance drug safety by identifying genetic variations that increase the risk of

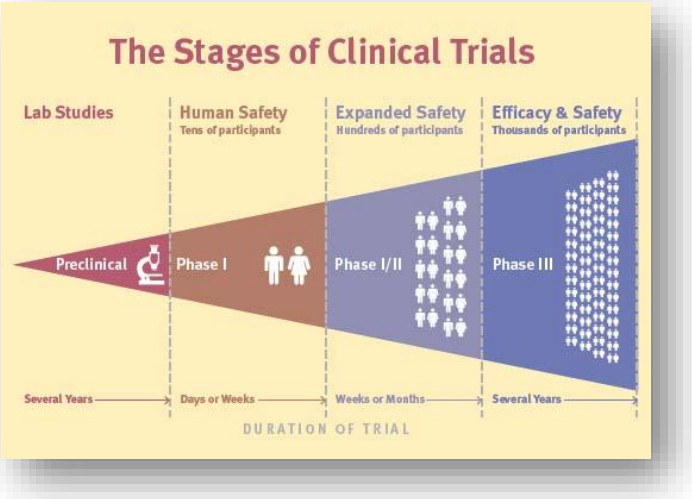

Figure 2: time span of clinical trials and safety

adverse drug reactions. For example, researchers can use genetic testing to identify patients who are at increased risk of developing liver toxicity from certain drugs and then monitor those patients more closely for signs of toxicity. Nutrigenomics can be used in drug screening to identify new drug candidates that target specific genes or pathways involved in disease. In the initial phases of drug discovery, High-throughput screening (HTS) is a commonly used technique.[19] Its purpose is to identify "hit" molecules that display activity against a target of interest from vast compound libraries that may contain thousands of molecules. They can use HTS screening methods to test large libraries of compounds for their ability to modulate gene expression or protein function. It can help identify potential drug-drug interactions based on an individual's genetic makeup. This knowledge can help clinicians avoid prescribing drugs that may interact negatively, reducing the risk of adverse side effects.

3.1 Understanding drug resistance

Nutrigenomics can help understand drug resistance by identifying genetic variations that make tumours or pathogens resistant to drugs. This information can be used to develop new drugs or drug combinations that are more effective against resistant strains. Nutrigenomics can also be used to develop personalized nutrition plans that complement drug therapies. For example, researchers can use genetic testing to identify patients who have a higher risk of developing nutrient deficiencies or who may benefit from specific dietary interventions. Nutrigenomics can be used to develop nutritional supplements that are tailored to an individual's unique genetic makeup. Nutraceuticals are functional foods or dietary supplements that have potential health benefits beyond basic nutrition.[1] Nutrigenomics can be used to identify bioactive compounds in food that may have health-promoting effects, as well as to understand how these compounds interact with genes and metabolic pathways in the body. By leveraging nutrigenomics, it may be possible to develop more targeted and effective nutraceuticals that can be used to prevent or treat specific diseases. For example, a nutraceutical containing a bioactive compound that targets a specific gene or pathway involved in the development of a particular disease could be developed. This approach could potentially provide a safer and more natural alternative to conventional drug therapies.[20]

Drug-food interactions occur when nutritional factors cause changes in a drug or when drug interaction leads to alterations in nutritional or dietary factors. Food-drug interaction as the approach in which nutrients from a specific food interact with a drug when both are taken together, resulting in changes in the drug's pharmacokinetics, bioavailability, therapeutic efficacy, and pharmacodynamics.[2] The authors give examples such as the neutralization of dietary vitamin K from plants with warfarin, leading to pharmacodynamic antagonism, and the bioflavonoid in grapefruit, which blocks an enzyme called CYP3A, leading to slow down of metabolism of many drugs.

Diabetes mellitus (DM) is a set of metabolic diseases caused by defects in insulin secretion, insulin activity, or both, resulting to hyperglycemia. DM is a global burden that causes dysfunction and/or failure of

cardiovascular and excretion systems. According to recent estimates by the International Diabetes Federation 2023 8.3% of adults (382 million individuals) have diabetes, and this number is expected to exceed 592 million within span of 25 years. DM can be classified into type 1(T1) and type 2 (T2) DM.[16] T2DM causes major health issues and a significant economic burden on budgets. Obesity is the risk factor for causing DM compared to individuals with a normal weight.[4] Other risk factors include fast food diets which have replaced conventional diets, including poultry, canned and refined macronutrients, and lipids.[18]

Hyperglycemia and hyperlipidemia are results of Irregular insulin secretion which has been observed in both obesity and T2DM.[21] Studies proposed that regular high intake of sugar and saturated fatty acid can lead to glucolipotoxicity, having negative effect on insulin secretion from the β-cells. Habitual coffee consumption is associated with a significantly reduced risk of T2DM as caffeic acid, chlorogenic acid, and ferulic acid and found in coffee and are associated with DM.

3.2 Drug discovery from natural products; Treatment of neurodegenerative diseases

Using natural products has been proven to be an effective method for discovering new pharmaceuticals. Many drugs that are currently approved were originally derived from natural compounds.[22] The chemical diversity of natural compounds surpasses that of artificially synthesized molecules found in man-made libraries. Natural compounds can associate with and modulate protein targets and may be regarded as an augmented drug-like molecules that have evolved over time. Despite this, in the past two decades, many pharmaceutical companies have reduced or eliminated their natural product discovery programs.[23] Monitoring natural products for pharmacologically active compounds is a formidable task that requires a substantial number of resources. To expedite the screening and recognition of the most promising molecules, innovative approaches are needed at the initial steps of drug discovery pipelines.[24]

Drug discovery from natural products has been an important approach for developing novel therapeutics for various diseases, including neurodegenerative disorders. Cerebral degenerative disorders such as Alzheimer's disease, Parkinson's disease, and Huntington's disease are specified by the continuous deprivation of neurons and their functions, resulting in cognitive impairment, movement disorders, and other neurological symptoms.[3] One of the major challenges in drug discovery for neurodegenerative diseases is the complexity and heterogeneity of the brain, which makes it difficult to develop drugs that can effectively cross the blood-brain barrier and target specific pathological processes in the brain. In addition, many drugs that show promise in preclinical studies fail to translate to clinical trials, often due to safety and efficacy issues.[23] Natural products have been a rich source of drug for many years, and there are several examples of natural products that have been used in the treatment of neurological disorders. For example, the alkaloid galantamine, derived from the snowdrop plant, is used to treat Alzheimer's disease. Similarly, the drug levodopa, used to treat Parkinson's disease, is a synthetic version of the natural amino acid L-dopa, which is obtained from broad bean plant.[25] Despite the potential of natural products, the discovery and development of new drugs from these sources face several challenges. One of the major issues is the limited availability of natural products, which are often difficult to extract and purify in sufficient quantities for drug development. In addition, natural products often have complex structures that can be challenging to synthesize and modify.[26] Another promising approach is the use of artificial intelligence (AI) and machine learning to screen large libraries of natural products and predict their potential therapeutic activity. These techniques can also be used to optimize the structure of natural products and improve their efficacy and safety profiles.

In conclusion, natural products offer a promising source of drug leads for the treatment of neurodegenerative diseases, but the challenges of discovering and developing new drugs from these sources remain.

However, recent advances in technology and computational methods offer novel solutions to these old problems and pave the way for the discovery of new and effective therapies for these devastating diseases.

3.3 Biomarkers in therapeutic and personalized Medicine

A biomarker is a biological substance that can be cellular, biochemical, molecular, genetic, protein, metabolite, specific post-translational modification, or physiological or physical signs.[27] Biomarkers are generally classified into three categories molecular, imaging, and psychometric. Molecular biomarkers are those that are measured at a molecular level, imaging biomarkers are those that are detected through imaging techniques such as CT scans, while psychometric biomarkers rely on measuring psychological or cognitive changes.[28] The Food and Drug Administration (FDA) pharmacogenomics guidance provides further clarification of biomarker categories, dividing them valid biomarkers based on available scientific information. Clinical endpoint biomarkers reflect how a patient feels, functions, or survives, while surrogate endpoint biomarkers substitute for a clinical endpoint. However, only a few biomarkers are surrogate endpoints, with the HIV 'viral' load being an example.[23]

Nevertheless, recent advances in genomics, transcriptomics, proteomics, metabolomics, cytometry, and imaging, in conjunction with bioinformatics and biostatistics, have made it possible to accelerate the discovery and development of specific biomarkers for complex chronic illnesses. Although many challenges remain, ongoing efforts to discover and develop disease-related biomarkers will improve decision-making throughout drug development and enhance our comprehension of disease processes. Furthermore, effectively translating preclinical biomarkers into clinical practice will pave the way for personalized therapies for complex disease areas, benefiting patients, healthcare providers, and the bio-pharmaceutical industry. Despite significant progress in cancer treatment, the development of personalized chemotherapeutic medications that are both biologically potent and have low cytotoxicity rates remains a significant challenge. However, two promising candidates, porphyran have been identified for their ability to modulate cell death pathways such as apoptosis and autophagy. These substances have the potential to act as a "magic bullet" against cancer cells that do not respond to traditional therapies or are resistant to multiple drugs. Future clinical trials could explore the synergistic effects of combining porphyran or OP with existing chemotherapeutic drugs, providing even greater potency. Not only are they cost-effective, but their selective cytotoxicity also makes them an ideal choice for cancer treatment. Furthermore, utilizing advanced delivery systems such as liposomes, polymers, microemulsions, or nano-carriers could further enhance the targeted delivery of porphyran and OP, improving their efficacy.[29]

Conclusion

In this synthetic review, we have explored the dynamic field of nutrigenomics and its implications for understanding and managing diseases and genetic disorders. Through a comprehensive analysis of current research findings, we have elucidated the intricate interplay between dietary components and genetic variations, shedding light on the mechanisms underlying gene-diet interactions and their impact on health outcomes. Our synthesis highlights the potential of nutrigenomics in personalized medicine, offering insights into tailored dietary interventions based on individual genetic profiles. By leveraging advances in genomic technologies and computational tools, researchers are increasingly able to unravel the complex relationships between diet, genes, and disease susceptibility. These insights have profound implications for disease prevention, treatment, and health promotion, paving the way for more targeted and effective interventions. Looking ahead, the prospects for nutrigenomics are promising. As our understanding of gene-diet interactions continues to evolve, so too will the development of novel therapeutic strategies and personalized nutrition approaches. Integrating nutrigenomic principles into clinical practice holds the potential to revolutionize healthcare delivery, enabling

more precise risk assessment, diagnosis, and treatment selection. Furthermore, the translation of nutrigenomics research into public health policies and guidelines has the potential to promote population-wide health benefits and reduce the burden of chronic diseases.

In conclusion, nutrigenomics represents a paradigm shift in our approach to health and disease, offering a pathway towards more personalized and effective interventions. By harnessing the power of nutrigenomics, we can unlock the full potential of nutrition in promoting health and mitigating the risk of diseases, ultimately improving the well-being of individuals and populations worldwide.

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