TANG [HUMANITAS MEDICINE]

Original Article

The Effect of wool in patients with chronic obstructive pulmonary disease

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ABSTRACT

The purpose of this study was to analyze the effect wool in patients with chronic obstructive pulmonary disease. The study was conducted experimentally on 53 patients with chronic obstructive pulmonary disease attending the chest diseases polyclinic of a hospital located in Erzurum. A randomized selection method was used to categorize patients into two groups; a treatment (n = 27), and a control group (n = 26). Patients in the treatment group (pre-test measurements were taken) wore wool vests for a period of three months, while patients in the control group wore cotton vests (placebo) for the same duration; post-test measurements were taken for both groups at the end of the three-month period. The Medical Outcomes Study Short Form 36, the St. George's Respiratory Questionnaire, and pulmonary function tests were used to collect data. Results concluded that there was a significant decrease ($p < 0.05$) in the overall score of the St. George's Respiratory Questionnaire, and the symptom, effect, and activity mean scores, while there was a significant increase ($p < 0.05$) in the SF-36 physical functioning, general health, bodily pain, role physical, vitality, role emotional, social functioning, mental health, physical and mental component summary mean scores of patients in the treatment group. Results of the study concluded that the symptoms, activity, disease effectiveness, and quality of life improved in patients that wore wool vests.

Keywords chronic obstructive pulmonary disease, wool vest, quality of life

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is chronic airflow limitation and a range of pathological changes in the lungs (GOLD, 2016). COPD continues to exert a heavy burden on the personal health of patients, and also on health economies throughout the world. It is estimated that COPD will be the third leading cause of death, worldwide, by 2020 (Gruffydd-Jones and Loveridge, 2011). COPD is diagnosed based on the presence of characteristic symptoms (e.g. breathlessness, sputum production and cough), clinical signs, and the demonstration of airflow obstruction illustrated using spirometry (Gruffydd-Jones and Loveridge, 2011). The purpose of treating COPD is to relieve symptoms, improve exercise tolerance, improve health status, prevent disease progression, prevent and treat complications, prevent and treat exacerbations and reduce mortality (Fromer, 2011; GOLD, 2016; Gooneratne et al., 2010; Postma et al., 2011; Yıldırım, 2010).

It is a known fact that those living in cold climates, and those working in open-air environments suffer from respiratory distress (shortness of breath), respiratory and bronchial symptoms more often (Kotaniemi et al., 2003; Kotaniemi et al., 2002). Other known facts about patients with COPD are that they are adversely affected by the cold, their pulmonary functions decrease, their attacks increase, the effects of their disease increase, they are required to stay at hospital extensively to be treated, and they need to protect themselves from the cold (Donaldson et al., 2012; Donaldson et al., 1999; Tascı et al., 2011; Wedzicha and Donaldson, 2003).

Burge reported that cold weather was bad for patients with COPD, and that they should wrap up warm by wearing sufficient clothing; he also reported that the clothing industry should develop clothes that kept people warm (Burge, 2006). The health status of patients with COPD improved when they maintained a temperature of 21°C in living areas for at least nine hours a day (Osman et al., 2008).

Nurses, who are a member of health professionals, play an important role in the care and treatment of patients with COPD. When caring for and treating patients with COPD, nurses should aim to reduce the symptoms of patients, increase their activity level, and increase their quality of life. Nurses achieve this by using all their dependent roles (applying medical treatment) and independent roles. Interventions regarding patient clothing are one of the independent roles of nurses. Nurses provide patients with professional support in identifying the necessary lifestyle regarding their clothes, and help patients chose suitable clothing. They can conduct studies regarding the type of clothing suitable for the disease, and add their findings to literature.

There has been no existing study in literature that addressed the effect wearing wool vests has on patients with COPD. The purpose of this study was to analyze the effect wool vest in patients with COPD.

MATERIALS AND METHODS

Design and participants

The study was conducted as a randomized controlled trial was conducted. This study was conducted on patients attending the chest diseases polyclinic of a hospital located in Erzurum.

The patients who had COPD, resided within the borders

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Table 1. Baseline Clinical and Demographic Characteristics of Treatment and Control Groups

Variable	Treatment (n = 27)	Control (n = 26)	Significant
Age, years, mean ± SD	64.8 ± 9.0	61.2 ± 10.2	p = 0.180
Gender			
Female (%)	9 (60.0)	6 (40.0)	p = 0.407
Male (%)	18 (47.4)	20 (52.6)	
Marital status			
Married (%)	19 (48.7)	20 (51.3)	
Single (%)	8 (57.1)	6 (42.9)	p = 0.589
Educational status			
Literate (%)	9 (52.9)	8 (47.1)	
Elementary school (%)	11 (45.8)	13 (54.2)	p = 0.763
High school / University (%)	7 (58.3)	5 (41.7)	
Smoking			
Smoker (%)	4 (33.3)	8 (66.7)	
Nonsmoker (%)	9 (69.2)	4 (30.8)	p = 0.198
Stop smoking (%)	14 (50)	14 (50)	
Disease duration, years, mean ± SD	8.6 ± 10.4	6.9 ± 7.4	p = 0.505
Body mass index (kg/cm), mean ± SD	28.3 ± 5.9	27.9 ± 6.7	p = 0.859
GOLG stage, mean ± SD	2.4 ± 0.9	2.5 ± 0.6	p = 0.937

of Erzurum, were not allergic to wool, and accepted to participate in the study were included in this study. A randomized selection method was used to categorize participants into two groups; a treatment (Group I), and a control group (Group II). A sealed opaque (non-transparent) envelope method was used to select patients for the treatment group and the control group. Patients satisfying the stated criteria and that had undergone a pre-test were designated their groups by picking an envelope, which stated a group name on it. 60 patients accepting to participate in the study, and meeting the criteria, were distributed into a treatment group and a control group. The study was completed with 53 patients, as three patients from the treatment group, and four patients from the control group passed away during monitoring. The treatment group comprised of 27 patients, and the control group comprised of 26 patients (Figure). There was no statistically significant difference between the treatment and the control group based on demographic and baseline clinical characteristics, such as age, gender, marital status, educational level, smoking status, disease duration, body mass index, and GOLD status (Table1). Patients in the treatment group were provided wool vests, while those in the control group acted as the placebo group, and were provided vests that were not wool.

Consent was obtained from each patient, and permission was granted by the Ataturk University Ethic Board, Erzurum, Turkey, before commencing the study.

Interventions

A questionnaire, Medical Outcomes Study Short Form 36 (SF 36), and St. George's Respiratory Questionnaire (SGRQ) were completed by all participants of the study at the polyclinic, as well as undergoing pulmonary function tests (pre-test). After completing their pre-test measurements, patients in the treatment group were sent home with wool vests, and asked to wear them as soon as they got home. The wool vests, given to the treatment group, were 75% merino wool, and 25% acrylic.

After completing their pre-tests, patients in the control group were sent home with cotton vests, whose color were similar to a wool vest, as a placebo, and asked to wear them as soon as they got home. The vests used by the patients in the control group were 100% cotton. Both patients in the treatment and the control group used to wear cotton vests prior to the study.

The patients in the treatment group wore the wool vests for the duration of three months, while patients in the control group wore the cotton vests for three months.

The researcher made one house visit every month to patients, and called them once a week to make sure that those in the treatment group were wearing their wool vests and those in the control group were wearing their cotton (placebo) vests.

Patients in both groups came back for their post-tests at the end of month 3; they all completed the SF-36, the SGRQ, and pulmonary function tests (post-test).

The polyclinic nurse (not familiar with the patient groups) completed the pre and the post-test SF-36 and SGRQ for both the patients in the treatment and the patients in the control group. A technician (not familiar with the patient groups), qualified to conduct pulmonary function tests, at the polyclinic conducted the pre and post-test pulmonary function tests of patients in both the treatment and the control group.

Measurements

The SF 36 the SGRQ, and pulmonary function tests were used to collect data. The SGRQ is a quality of life measure specifically designed for patients with COPD. It provides valid and reliable measures of respiratory symptoms and is sensitive to change in objective measures of respiratory function. The 50 items vary in form between polytomous and dichotomous (eg, true/false). An overall and three component scores are provided: activity (16 items), symptoms (8 items), and impacts (26 items). These are: • activity: physical activities that either cause or are limited by breathlessness. • symptoms: frequency of cough, sputum production, wheeze, breathlessness, and duration and frequency of attacks • impact: employment, being in control of health, panic, stigma, need for medication and side effects, health expectations, and disturbances in daily life. Scores range between 0 (no impairment) and 100 (worst possible health) (Jones et al., 1991; Meguro et al., 2007).

The most widely used generic questionnaire, the Medical Outcomes Study Short Form 36 (SF-36), has been widely accepted in recent years as the best generic Health-related quality of life measurement. It contains 36 items, divided into eight domains: Social functioning, Physical functioning, General health, Vitality, Role physical, Role emotional, Bodily pain and Mental health. These domains create a profile of the subject. Two summary scores can also be aggregated, the mental and the physical component summary. For each component, the final result is calculated using a scale ranging from 0 to 100, in which 0 corresponds to the worst health status and 100 corresponds to the best health status (Ware, 2000). The Turkish version of the SF 36 was validated by Koçyiğit et al (Kocyigit et al., 1999).

Pulmonary function tests: Airflow obstruction, usually measured using spirometry, is a useful marker of disease, since testing is reasonably reproducible and widely available. Spirometry should be undertaken in all patients who may have COPD. Spirometry should measure the volume of air forcibly exhaled from the point of maximal inspiration (FVC) and the volume of air exhaled during the first second of this maneuver (FEV1), and the ratio of these two measurements (FEV1/FVC) should be calculated. Patients with COPD typically show a decrease in both FEV1 and FVC.

Table 2. Comparison of Score Pre Test and Post Test in the Treatment Group

Measures (score range)	Pre–test (n = 27) Mean ± SD	Post–test(n = 27) Mean ± SD	t	Significant
Pulmonary function tests				
FVC, L	2.6 ± 1.0	2.7 ± 0.9	-0.215	p = 0.832
FVC, % predicted	82.5 ± 24.5	82.9 ± 23.9	-0.159	p = 0.875
FEV1, L	1.4 ± 0.7	1.5 ± 0.7	-0.479	p = 0.636
FEV1, % predicted	56.6 ± 22.9	55.9 ± 23.0	-0.108	p = 0.915
FEV1/FVC, % predicted	52.1 ± 13.3	52.4 ± 14.6	-0.263	p = 0.795
St. George's Respiratory Questionnaire				
Total score (0 – 100)	68.8 ± 22.6	52.3 ± 14.6	4.433	p = 0.000
Symptoms (0 – 100)	57.7 ± 16.8	48.7 ± 6.8	2.413	p = 0.023
Impact (0 – 100)	63.7 ± 25.3	44.5 ± 15.3	4.927	p = 0.000
Activity (0 – 100)	79.3 ± 22.5	67.8 ± 16.5	4.176	p = 0.000
Short Form 36				
Physical functioning	31.1 ± 30.8	50.7 ± 29.1	-4.019	p = 0.000
Role-physical	21.3 ± 37.8	45.4 ± 31.0	-5.573	p = 0.000
Bodily pain	42.4 ± 27.2	59.7 ± 24.3	-3.336	p = 0.003
General health	33.1 ± 21.4	46.5 ± 16.6	-3.901	p = 0.001
Vitality	29.1 ± 22.3	49.8 ± 12.4	-5.445	p = 0.000
Social functioning	44.9 ± 31.8	60.9 ± 20.1	-3.638	p = 0.001
Role-emotional	11.1 ± 12.2	24.1 ± 25.5	-2.563	p = 0.017
Mental health	38.8 ± 26.4	57.5 ± 22.1	-3.464	p = 0.002
Physical component summary	31.9 ± 26.0	50.6 ± 19.5	-6.192	p = 0.000
Mental component summary	30.9 ± 21.4	48.1 ± 11.5	-5.142	p = 0.000

The presence of airflow limitation is defined by a post-bronchodilator FEV1/FVC < 0.70 (Gruffydd-Jones and Loveridge, 2011; Rabe et al., 2007).

Statistical analysis

The Chi-Square tests was used in order to compare the clinical and demographic characteristics of patients in the treatment and the control group (gender, marital status educational status, and smoking). The independent sample t-test was used in order to compare the age, disease duration, body mass index and GOLD stage of patients in the treatment and the control group (Table 1). The paired samples t-test was used to compare pre and post-test results within the treatment group (Table 2). The independent samples t-test was used in order to compare the pre and post-test data of patients in the treatment group to those in the control group (Table 3).

RESULTS

There was a significant decrease ($p < 0.05$) in the overall post-test SGRQ score, and the mean of symptom, effect, and activity score of patients in the treatment group (Table 2).

There was a significant increase ($p < 0.05$) in the mean of post-test SF-36 role physical, physical functioning, bodily pain, vitality, general health, role emotional, social functioning, mental health, physical and mental component summary scores of patients in the treatment group (Table 2).

There was no significant difference ($p > 0.05$) between means of pre and post-test pulmonary function test scores of patients in the treatment group (Table 2).

There was a significant decrease ($p < 0.05$) in the overall post-test SGRQ score, and the mean of symptom, effect, and activity scores of patients in the treatment group in comparison to the mean of post-test scores of patients in the control group. There was a significant increase ($p < 0.05$) in the mean of post-test SF-36 role physical, bodily pain, physical functioning, general health, social functioning, role emotional, vitality, mental health, physical and mental component summary scores of patients in the treatment group in comparison to the mean of post-test scores of patients in the control group (Table 3). There was no significant difference ($p > 0.05$) between the mean pre-test pulmonary function test, St George Respiratory Questionnaire, and SF-36 quality of life (all sub-scales) scores of patients in the treatment group and those in the control group (Table 3).

DISCUSSION

There was a significant decrease in the symptoms (cough, sputum production, wheeze, and breathlessness), a significant increase in activity, a significant decrease in the effects of the disease, and a significant increase in the quality of life of patients in the treatment group after wearing wool vest for three months. There are no studies regarding the effect using wool vests has on patients with COPD in literature.

Cold exposure elicits several effects on the respiratory system. Bronchoconstriction occurs in the lung, and increase secretions and decreased mucociliary clearance. Chronic exposure to cold environments results in increased numbers of goblet cells and mucous glands, hypertrophy of airway muscular fascicles, and increased muscle layers of terminal arteries and arterioles. (Giesbrecht, 1995). Facial cooling seems to be the most important trigger for bronchoconstriction due to cold weather in patients with COPD and may also contribute to the increase in ventilation under such conditions. Cold weather seems to worsen exercise-associated dyspnea, especially in patients with severely impaired ventilatory reserve. Theoretically, such patients might benefit from wearing protective clothing over their face in cold weather. Patients with severe COPD might benefit from wearing protective clothing over their face in cold weather (Koskela et al., 1996).

The health status of patients with COPD improved when

Table 3. Comparison of Score Pre-test and Post-test in the Treatment and Control Groups

Measures		Treatment (n = 27) Mean ± SD	Control (n = 26) Mean ± SD	t	Significant
Pulmonary function tests					
FVC, L	Pre–test	2.6 ± 1.0	2.8 ± 0.9	-0.528	p = 0.600
	Post–test	2.7 ± 0.9	2.5 ± 0.7	0.829	p = 0.411
FVC, % predicted	Pre–test	82.5 ± 24.5	82.7 ± 22.1	-0.033	p = 0.974
	Post–test	82.9 ± 23.9	78.4 ± 16.3	0.797	p = 0.429
FEV1, L	Pre–test	1.4 ± 0.7	1.5 ± 0.5	-0.396	p = 0.694
	Post–test	1.5 ± 0.7	1.3 ± 0.4	0.967	p = 0.338
FEV1, % predicted	Pre–test	55.6 ± 22.9	53.8 ± 17.8	0.326	p = 0.745
	Post–test	55.9 ± 23.0	52.9 ± 14.6	0.561	p = 0.577
FEV1/FVC,% predicted	Pre–test	52.1 ± 13.3	52.2 ± 9.7	-0.025	p = 0.980
	Post–test	52.4 ± 14.6	50.7 ± 7.8	0.530	p = 0.598
St. George's Respiratory Questionnaire					
Total score	Pre–test	68.8 ± 22.6	64.5 ± 16.9	0.778	p = 0.440
	Post–test	52.3 ± 14.6	61.9 ± 15.6	-2.318	p = 0.024
Symptoms	Pre–test	57.7 ± 16.8	61.3 ± 19.9	-0.695	p = 0.490
	Post–test	48.7 ± 6.8	63.7 ± 20.3	-3.642	p = 0.001
Impact	Pre–test	63.7 ± 25.3	56.9 ± 20.7	1.066	p = 0.291
	Post–test	44.5 ± 15.3	55.3 ± 20.2	-2.200	p = 0.032
Activity	Pre–test	79.3 ± 22.5	78.6 ± 17.9	0.122	p = 0.903
	Post–test	67.8 ± 16.5	77.6 ± 17.4	-2.093	p = 0.041
Short Form SF- 36					
Physical functioning	Pre–test	31.1 ± 30.8	31.5 ± 29.9	-0.051	p = 0.959
	Post–test	50.7 ± 29.1	33.3 ± 28.4	2.210	p = 0.032
Role-physical	Pre–test	21.3 ± 37.8	21.1 ± 34.4	0.014	p = 0.989
	Post–test	45.4 ± 31.0	24.0 ± 33.5	2.405	p = 0.020
Bodily pain	Pre–test	42.4 ± 27.2	43.1 ± 22.7	-0.112	p = 0.911
	Post–test	59.7 ± 24.3	44.8 ± 22.8	2.286	p = 0.026
General health	Pre–test	33.1 ± 21.4	34.8 ± 21.4	-2.282	p = 0.779
	Post–test	46.5 ± 16.6	35.4 ± 19.0	2.263	p = 0.028
Vitality	Pre–test	29.1 ± 22.3	35.0 ± 24.2	-0.927	p = 0.358
	Post–test	49.8 ± 12.4	38.7 ± 20.4	2.417	p = 0.019
Social functioning	Pre–test	44.9 ± 31.8	47.4 ± 25.1	-0.327	p = 0.745
	Post–test	60.9 ± 20.1	48.3 ± 23.3	2.115	p = 0.039
Role-emotional	Pre–test	11.1 ± 21.2	8.7 ± 18.6	0.448	p = 0.656
	Post–test	24.1 ± 25.5	10.6 ± 20.2	2.132	p = 0.038
Mental health	Pre–test	38.8 ± 26.4	42.8 ± 27.2	-0.537	p = 0.594
	Post–test	57.5 ± 22.1	41.5 ± 23.9	2.520	p = 0.015
Physical component summary	Pre–test	31.9 ± 26.0	32.7 ± 32.7	-0.100	p = 0.921
	Post–test	50.6 ± 19.5	34.4 ± 21.6	2.862	p = 0.006
Mental component summary	Pre–test	30.9 ± 21.4	33.5 ± 20.4	-0.435	p = 0.665
	Post–test	48.1 ± 11.5	34.8 ± 16.3	3.447	p = 0.001

they maintained a temperature of 21°C in living areas for at least nine hours a day. Osman et al. concluded that there was a significant relationship between the SGRQ symptom scores of patients with COPD, kept in a living room at 21°C for at least 9 hours, and the number of days patients stayed in the room; the same patients also had a better SGRQ effect score. The results of the study suggest that indoor warmth at home influences the status of respiratory health, and that the 21 C for 9 h index is a useful indicator of whether indoor warmth is sufficient for health. This is a potentially important finding (Osman et al., 2008).

In relatively warmer countries, indoor temperatures need to be higher in cold weather in both living rooms and bedrooms; patients with COPD need to be able to afford heating, and houses need to be designed with warmer bedrooms. However, cold stress is detrimental, and requires adequate clothing. The clothing industry is faced with a challenge to develop socially desirable warm clothing. "We" are therefore clothing manufacturers, fashion designers, primary care physicians, nurses, respiratory specialists, and social planners, all of who should work together to reduce the impact of COPD on those suffer from it (Burge, 2006).

Clothes maintain body temperature (homeostasis), which is a basic human need, by protecting the body against temperature changes, and other external effects (Cakırcalı 1996, Guyton 2001, Ulusoy and Gorgulu 1997). Wool, which is made of animal fiber, is preferred during the winter season and in cold regions due to the fact that its capacity of maintaining heat is higher in comparison to plant or synthetic fibers, and restricts heat penetration (Onlu, 1995; Yazıcıoglu, 2000). There are crimps in the structure of wool fiber (due to it being three-dimensional). When wool fibers, which have numerous crimps, are wound to form thread their crimps come together; air is left between crimps, as it is not possible to bring them together completely. Threads made from crimped wool, which has an extensive amount of still air (a great insulator) do not transfer heat, and keep you warm. Wool is a special insulator and restricts heat transfer. It prevents the air flow between the human body and the outside. It is set forth that felting, which is a physical property specific to wool and not found in organic and synthetic fibers, and heat, moisture, and pressure need to be present together for felting to occur (Gurcum, 2005; Onlu, 1995; Yazıcıoglu, 2000). Wool is the most hygroscopic raw material in textiles. Wool is able to hold water depending on the relative moisture and temperature of its surroundings; based on the type of wool fiber, wool can absorb 30% - 50% of its dry weight in dampness (Gurcum, 2005; Komisyon, 1996; Onlu, 1995; Yazıcıoglu, 2000). In the event of sweating, a wool vest absorbs the sweat immediately. As wool fiber has a lot of crimps, the skin does not come into contact with the entire fiber, but touches a small number of points. The skin does not

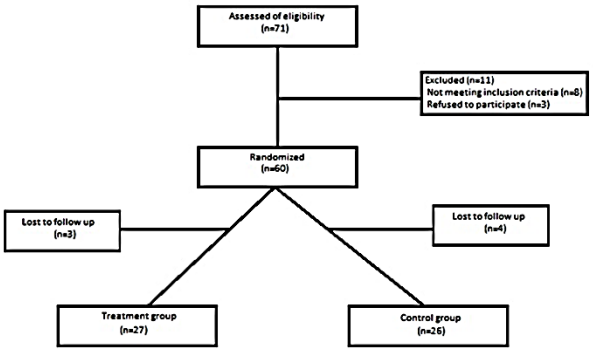

Fig.1. Distribution of study patients

feel any wetness from sweating, preventing the individual from getting a cold as a result of their sweat cooling on their body. This is the reason why wool is particularly used in manufacturing underwear (Yazıcıoglu, 2000).

At the beginning of our study we stated that the disease deteriorated in 88.7% of patients in cold weather. Study results concluded that patients in the treatment group no longer felt cold after wearing wool vests. We believe that the decrease in symptoms (cough, sputum production, wheeze, breathlessness), increase in activity, decrease in effects of disease, and increase in the quality of life of patients in the treatment group is based on the fact that wool keeps them warm. Nurses contribute significantly treating the disease by providing patients with COPD that are affected by the cold information about warm clothing, and acting as their mentors.

This study should be assessed as a pilot study that investigates the effect wool has on patients with COPD, as there are no studies available in literature regarding the subject. Therefore, the results of this study have not been compared to results of similar studies.

Results of this study, conducted to investigate the effect wool has on patients with COPD, concluded that there was an important decrease in the symptoms (cough, sputum production, wheeze, breathlessness) of patients that used wool, as well as a significant increase in their activity, significant decrease in effects of disease, and an important increase in their quality of life; however there was no significant change in pulmonary function tests.

In conclusion, patients with COPD were recommended to wear wool vests, which are easily accessible, cheap to buy, and easy to use to decrease their symptoms, increase their activity level, decrease the effects of their illness, and increase their quality of life.

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CONFLICT OF INTEREST

The author declares that they have no conflict of interest.

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