

Camel milk in asthmatic children: a double blind randomized clinical trial

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Abstract

Asthma is one of the prevalent diseases in children. There is some evidence regarding benefits of camel milk in asthma. Present study was carried out evaluating the effect of camel milk in asthmatic children. A randomized double blind clinical trial was operated between 2018 and 2019 in a tertiary center. Sixty children aged more than 6 years with not well control asthma were included. Intervention was consist of 200 milliliter camel milk or placebo daily for 2 months. Spirometry parameters and medication regimen were assessed before and after intervention. Data was analyzed using SPSS software. A total of 57 patients completed the trial. Patients were similar in demographic and baseline characteristics ($p > 0.05$). There was a significant difference between groups after intervention in use of inhaled corticosteroids (96.7% versus 70.4%, p value = 0.01), short acting beta agonists (53.3% versus 29.6%, p value = 0.0001) and long acting beta agonists (53.3% versus 40.7%, p value = 0.04) in control and intervention respectively. The percent of changes in forced expiratory volume (FEV1) in control and intervention groups was 18.54 ± 14.89 and 21.89 ± 17.83 respectively ($p = 0.14$). The percent of changes in FEV1/forced vital capacity (FVC) in control and intervention groups was 8.11 ± 7.12 and 11.11 ± 8.33 respectively ($p = 0.14$).

Conclusion: Camel milk leads to significant decrease in inhaled corticosteroids, short acting beta agonists and long acting beta agonist's use, surprisingly. It was suggested that camel milk is added to pharmacological treatment of asthmatic children after more studies.

What Is Known

- In many children the good control of asthma not achieved with the chemical medications.
- compliance of chemical medications are lower in children compared to adults

What is new?

- The effect of camel milk in asthmatic children was studied for the first time
- Camel milk leads to decrease in inhaled corticosteroids, short acting beta agonists and long acting beta agonist's use, significantly

Introduction:

Asthma is one of the common chronic inflammatory diseases during childhood with the prevalence of 15% (1). It characterized by wheeze, shortness of breath, cough and many other symptoms leading to economic burdens, psychological disorders and decreased quality of life (2). In many patients the good control of asthma not achieved with the chemical medications. On other hand compliance of chemical medications are lower in children compared to adults (3). World Health Organization (WHO)

recommended people to use natural products especially in developing countries, because of generally low price, less side effects as well as more compliance (4).

Benefit properties of camel milk been reported in several studies. It consist of antidiabetic (5, 6), anti-hyperlipidemia (5, 7), improvement of autistic behavior (8, 9) and many other reports (10–12). There is some evidence that camel milk has anti-inflammatory effects (13–15). But there is not any randomized clinical trial (RCT) evaluating the effect of camel milk in children with asthma.

To offer new insight, present double blind randomized clinical study was carried out, evaluating the effect of 200 milliliter (ml) camel milk daily for 2 months on asthmatic children aged more than 6 years.

Patients And Methods:

Present study was a double blind randomized clinical trial. It was done between 2018 and 2019 in a tertiary center, Mashhad University of Medical Sciences, Mashhad, Iran. The study population were children aged more than 6 years with a not well controlled asthma according to nelson reference book and have forced expiratory volume (FEV1) between 60%-80% and FEV1/ forced vital capacity (FVC) between 75%-80% in primary spirometry.

This study was approved in medical ethics committee (code: IR.MUMS.fm.REC.1396.555) and registered in Iranian registry of clinical trials (IRCT) (code: IRCT20170813035653N2).

Following written parental consent, combined with patient consent in appropriate cases, 60 children (age range: 6–18 years) with approved asthma were included. All clinical examination was done by one pediatrics pulmonologist. Patients were excluded if they have an asthma attack during study. Consort flowchart of study is shown in Fig. 1. Intervention was consist of 200 ml pasteurized camel milk daily for 2 months. Cow milk was considered as placebo and was packaged as same as camel milk. Spirometry was performed using CHEST HI-801 device (Japan).

Randomization was based on computer generated random sequence. Allocation concealment was done via sealed envelope. Primary outcomes were evaluated by an expert who was not involved in the study. Thirty patients in each group (totally 60 patients) were considered appropriate according to 20% detectable change between control and intervention group according to an expert opinion.

Statistical analysis

Data was analyzed using SPSS 16 (SPSS Inc, Chicago, Illinois, United States). Association of qualitative variables was tested by Fisher exact test or Chi square. Quantitative variables were compared using independent-samples T test. A p value less than 0.05 was considered statistically significant.

Results:

Baseline characteristics

Among 60 enrolled patients, 57 patients completed the study included 30 patients in control group and 27 ones in intervention group. Nineteen patients (63.3%) and 20 patients (74.1%) were male in control and intervention group respectively ($p = 0.28$). The mean age of patients in control and intervention group was 11.4 ± 2.31 and 9.74 ± 2.67 years respectively ($p = 0.08$). FEV1 was 70.23 ± 8.64 and 74.23 ± 8.10 percent in control and intervention group respectively. FEV1/FVC was 78.9 ± 2.92 and 79.3 ± 3.51 percent in control and intervention group respectively ($p > 0.05$). Inhaled corticosteroids (ICS), short acting beta agonists (SABA) and long acting beta agonists (LABA) were the most common medications in control and intervention group ($p > 0.05$). Totally patients were similar in demographic and baseline characteristics. Data is presented in Table 1.

Table 1
Demographic and baseline characteristics of included children

variables	Intervention group (n = 27) Mean \pm SD/frequency (%)	Control group (n = 30) Mean \pm SD/frequency (%)	P value
Age (year)	9.74 ± 2.67	11.4 ± 2.31	0.08*
Sex (%)	20 (74.1%)	19 (63.3%)	0.25#
Male	7 (25.1%)	11 (36.7%)	
female			
FEV1 (%)	74.23 ± 8.10	70.23 ± 8.64	0.07*
FEV1/FVC	79.3 ± 3.51	78.9 ± 2.92	0.64*
ICS	26 (96.3%)	30 (100%)	0.47#
SABA	21 (77.8%)	20 (66.7%)	0.29#
LABA	17 (56.7%)	16 (59.3%)	0.99#
Oral corticosteroids	1 (3.7%)	3 (10%)	0.61#
Other drugs	9 (33.3%)	15 (50%)	0.28#
SD = standard deviation, FEV1 = forced expiratory volume, FVC = forced vital capacity, ICS = inhaled corticosteroids, SABA = short act beta agonist, LABA = long act beta agonist *Independent t test, # chi square test or fisher exact test			

Spirometry parameters and medications

After 2 months, the FEV1 in control and intervention group was 84.73 ± 10.35 and 88.20 ± 15.80 respectively. The FEV1/FVC in control and intervention group was 85.20 ± 4.87 and 88.04 ± 6.95

respectively. The percent of changes in spirometry parameters was not significant between groups. Data is presented in Table2

Table 2
Changes in spirometry parameters and medications in included children after intervention

variables	Intervention group (n = 27) Mean ± SD/frequency (%)	Control group (n = 30) Mean ± SD/frequency (%)	P value
Changes in FEV1 (%)	21.89 ± 17.83	18.54 ± 14.89	0.19*
Changes in FEV1/FVC (%)	11.11 ± 8.33	8.11 ± 7.12	0.14*
ICS	19 (70.4%)	29 (96.7%)	0.01#
SABA	8 (29.6%)	16 (53.3%)	0.0001#
LABA	11 (40.7%)	16 (53.3%)	0.04#
Oral corticosteroids	0	1 (3.3%)	0.99#
Other drugs	2 (7.4%)	7 (23.3%)	0.03#
SD = standard deviation, FEV1 = forced expiratory volume, FVC = forced vital capacity, ICS = inhaled corticosteroids, SABA = short act beta agonist, LABA = long act beta agonist *Independent t test, # chi square test or fisher exact test			

There was a significant difference between groups in ICS use after intervention (96.7% versus 70.4% in control and intervention respectively, p value = 0.01). There was a significant difference between groups in SABA (53.3% versus 29.6% in control and intervention respectively, p value = 0.0001) and LABA (53.3% versus 40.7% in control and intervention respectively, p value = 0.04) use. There was a significant difference between groups in other drugs including montelukast, cetirizine and etc. (23.3% versus 7.4% in control and intervention respectively, p value = 0.039).

There was no significant difference between groups in oral corticosteroids (p = 0.99).

Data is presented in Table2.

There was no asthma attack in control and intervention group during study. There was no adverse effect, to use of camel milk.

Discussion:

In a double blind randomized clinical trial, 57 children aged more than 6 years were studied evaluating the effect of camel milk in children with asthma. To the best of our knowledge, benefits of camel milk in asthmatic children was confirmed in present study for the first time. According to results, consumption of

ICS, SABA, LABA and other drugs significantly decreased in intervention group compared to control. Also the percent of changes of spirometry parameters was more in intervention group but not significantly.

The use of natural products was increased during last decades (16, 17). Camel milk was used extensively worldwide because of its therapeutics and preventive properties in several conditions including allergy (18), cancer (19), diabetes (5) and immune disorders (20). Because of increased use of camel milk, clinicians must be aware of its pharmacological properties. To the best of our knowledge present study is the first research demonstrating the efficacy of camel milk in asthmatic children. Clinical efficacy of camel milk in asthma was studied only in a RCT in adults by Ravaghi et al. (21). According to Ravaghi the changes in the mean of FEV1 significantly was higher in intervention group compared to control. In our study spirometry parameters did not change significantly. It may be due to our studied population which were children. There are some challenges in use of spirometry for children. Children may uptake the exact instruction of spirometry difficultly and may have less cooperation for procedure which affect the results.

Camel milk is different with other mammalian milks (22–24). It had more minerals and vitamins as well as antioxidants. In comparison with cow milk, camel milk has more whey protein including lactoferrin and immunoglobulin G (IG) and other antibodies (25, 26). The relationship between IgG deficiency and asthma and allergy is recognized completely (27, 28). In attention to high content of IgG in camel milk, it can be used as a good option in children with asthma and food allergy. On the other hand asthma is an inflammatory disease. According to documents camel milk decrease tumor necrosis factor alpha (TNF- α), transforming growth factor beta (TGF- β), interleukin 6 (IL6), and interleukin 17 (IL17) (29, 30), therefore it can be effective in improvement of disease's signs.

Anti-inflammatory and immunomodulatory properties of camel milk were investigated in some experimental and clinical studies (15, 31, 32). In a study by Zhu et al. it has been demonstrated that camel milk can decrease TNF- α , IL1B and oxidative stress markers in mice with acute respiratory syndrome (33). Despite of several evidences regarding the anti-inflammatory, immunomodulatory and antioxidant properties of camel milk, more clinical trials are needed to confirm the traditional knowledge lead to comprehensive use of camel milk in asthmatic patients.

Due to the beneficial effects of camel milk in asthmatic children, further studies with larger sample sizes are suggested to examine the effects of camel milk in more detail.

Limitations:

Poor cooperation of children for spirometry was the main limitation of present study.

Conclusion:

Camel milk surprisingly leads to significant decrease in ICS, SABA, LABA and other drugs consumption and better general condition in asthmatic children. It was suggested that camel milk is added to

pharmacological treatment of asthmatic children after more studies.

Abbreviations

RCT: randomized clinical trial

WHO: World Health Organization

ml: milliliter

FEV1: forced expiratory volume

FVC: forced vital capacity

IRCT: *Iranian registry of clinical trials*

ICS: Inhaled corticosteroids

SABA: short acting beta agonists

LABA: and long acting beta agonists

IG: immunoglobulin G

TNF- α : tumor necrosis factor alpha

TGF- β : transforming growth factor beta

IL6: interleukin 6

IL 17: interleukin 17

Declarations

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Code availability: N/A

Authors' contributions:

Seyed Javad Sayedi, Elham Bakhtiari, Saeid Zibaee: conception or design

Elham Bakhtiari, Soudabeh Nekouhi, Saeid Zibae, Hasan Rakhshandeh: acquisition, analysis

Elham Bakhtiari, Soudabeh Nekouhi, Saeid Zibae, Hasan Rakhshandeh, Seyed Javad Sayedi: drafting the work

Elham Bakhtiari, Soudabeh Nekouhi, Saeid Zibae, Hasan Rakhshandeh, Seyed Javad Sayedi: final approval

Ethics approval:

All procedures performed in studies including human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Present study was approved by Mashhad University of Medical Sciences Ethical committee (code: IR.MUMS.fm.REC.1396.555). Present study does not contain any study on animals.

Consent to participate:

Written informed consent was obtained from all study participants or their parents.

Consent for publication:

All authors are agree to publish the manuscript.

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Figures

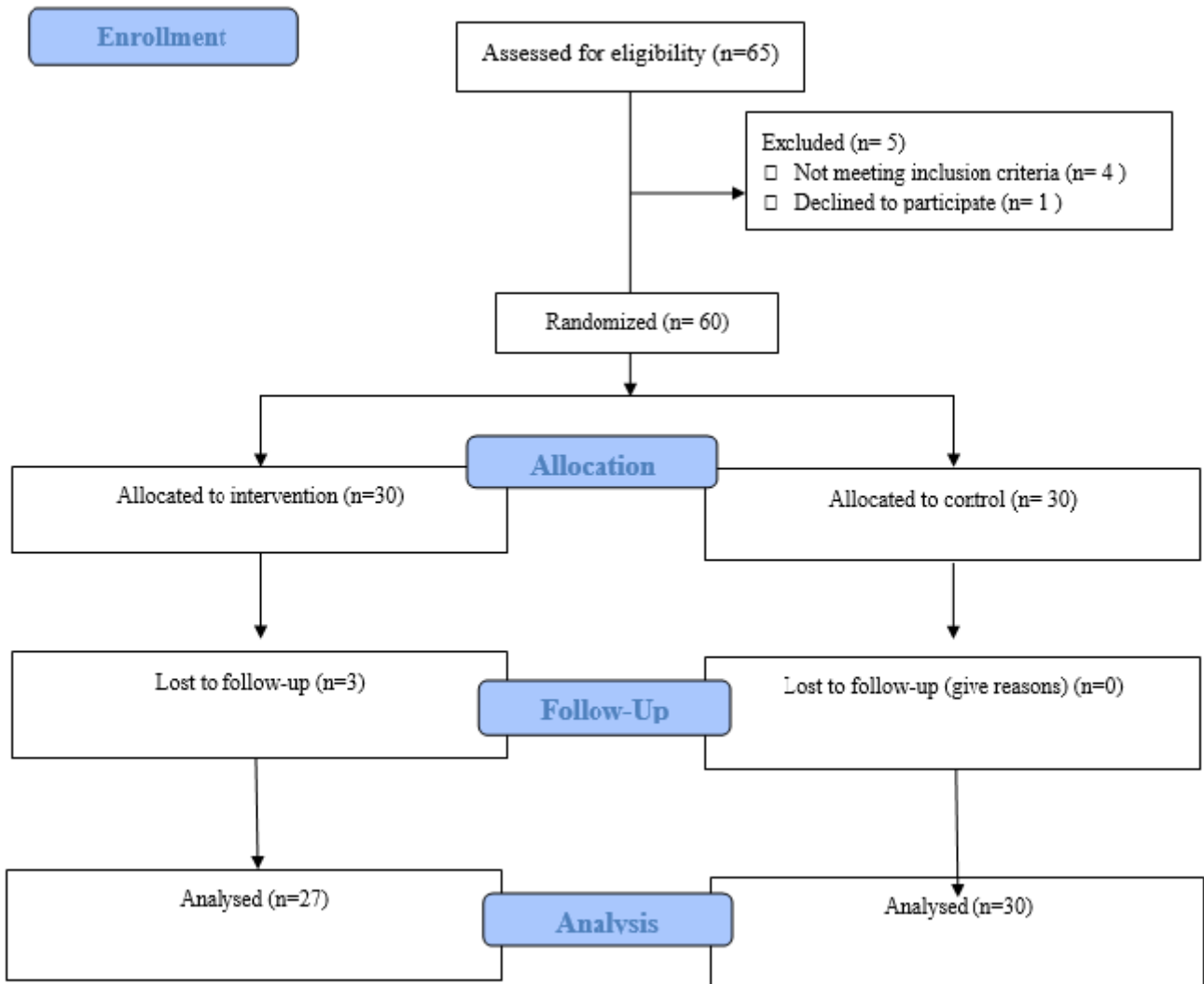


Figure 1

CONSORT flow diagram of the study