Research Article

The Application of Natural Camel Milk Products to Treat Autism-Spectrum Disorders: Risk Assessment and Meta-Analysis of Randomized Clinical Trials

Mahmoud Kandeel and Wael El-Deeb

1Department of Biomedical Sciences, College of Veterinary Medicine, King Faisal University, Al-Hofuf 31982, Al-Ahsa, Saudi Arabia
2Department of Pharmacology, Faculty of Veterinary Medicine, Kafrelshikh University, Kafr El-Shikh 33516, Egypt
3Department of Clinical Sciences, College of Veterinary Medicine, King Faisal University, Al Hofuf, Al-Ahsa, Saudi Arabia
4Department of Internal Medicine, Infectious Diseases and Fish Diseases, Faculty of Veterinary Medicine, Mansoura University, Mansoura, Egypt

Correspondence should be addressed to Mahmoud Kandeel; mkandeel@kfupm.edu.sa

Received 6 April 2022; Revised 28 April 2022; Accepted 9 May 2022; Published 27 May 2022

Copyright © 2022 Mahmoud Kandeel and Wael El-Deeb. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Camel milk is better tolerated than the milk of other ruminants, potentially expanding its consumer appeal. It also contains essential vitamins, minerals, and immunoglobulins, providing the milk with antioxidant, antibacterial, and antiviral properties. These properties may reduce oxidative stress in camel milk consumers, ameliorating many conditions, including those of the CNS, such as autism spectrum disorders (ASDs). We performed a meta-analysis of randomized controlled trials (RCTs) in which camel milk administration (boiled or raw) was examined as an ASD treatment intervention. The primary endpoint was participants’ total autism scores, determined using the Childhood Autistic Responsiveness Scale (CARS). A comparison of the responsiveness in these ASD intervention groups yielded a mean difference (MD) of 1.99 (0.89, 3.08) in those consuming boiled camel milk, MD = 2.77 (1.92, 3.61) in raw camel milk consumers, and MD = −1.02 (−0.10, 2.13) in cow milk consumers. Heterogeneity was notably low among the examined studies. Treatment of ASD with raw and boiled camel milk resulted in significantly lower CARS scores than the placebo. Our findings support the development of larger, more populated RCTs to establish camel milk’s overall potential as a therapeutic intervention for CNS disorders.

1. Introduction

In many countries, milk has long been a staple component of the human diet. Currently, cow milk production is a significant cause of environmental concern, as it leads to substantial carbon/methane emissions, water pollution, soil erosion, and over-foraging. In contrast to cows, milk-producing camels, primarily reared in the Middle East and North Africa, are considered eco-friendly, low-waste animals [1]. Camels generate less than half the carbon emissions of dairy cows and are more efficient milk producers. Furthermore, their milk is considered more nutritionally beneficial. Recently, camels have been associated with MERS-CoV, an emerging coronavirus [2, 3]. Although there are unresolved questions regarding the zoonotic aspects of MERS-CoV, specific camel milk antibodies may also provide coronavirus cross-protection [4]. Researchers have demonstrated the therapeutic value of camel milk in managing diabetes [5–7], hepatitis B [8], hepatitis C [9], Helicobacter pylori infections, enterocolitis, lactase deficiency in children [10, 11], pulmonary tuberculosis [12], liver cirrhosis [13], and cancer [14]. Furthermore, the unique composition of camel milk includes multiple protective proteins such as lysozymes, immunoglobulins, and lactoperoxidase, making it similar to human breast milk and serving to protect against infection and bolster immunological responses [15, 16].
Camel milk is also low in cholesterol, lactose, and fat content [17] and high in vitamins and minerals, most abundantly sodium, magnesium, zinc, copper, and potassium [18]. Specifically, camel milk has higher concentrations of vitamins A, B2, C, and E [19, 20] and higher zinc and iron concentrations than goat or cow milk. Moreover, camel milk contains a relatively high amount of polyunsaturated fats and linoleic and linolenic fatty acids, which are essential for human nutrition [21]. The IgA and IgG immunoglobulins in camel milk provide significant protection against viruses and bacteria. Casein is the primary protein found in camel milk, and its association with other whey proteins supplies albumin, immunoglobulins, and lactoferrins. Furthermore, lysine, threonine, valine (all essential amino acids) and glycine are predominant in camel milk [22].

Autism spectrum disorder (ASD) is a collection of developmental impairments manifested by challenges in communication and interpersonal interactions, stereotypical behaviors, and limited interactions. Early studies demonstrated that ASDs were significantly heritable [23] and have been observed to exhibit high phenotypic heterogeneity regarding presentation during human development. However, the root cause of ASD remains undetermined and, at times, contentious. A strong association has been found between ASD development and autoimmunity [24], based on the high prevalence of brain-specific autoantibodies in the brains of children with autism. The mechanism of autoantibody development in the brain is still not adequately understood. Some have speculated that they trigger autoimmune reactions in neurons via cross-reactive neuronal antigens [25]. Furthermore, oxidative stress [26, 27] and genetic polymorphism [28] have also been proposed to be involved in ASD pathogenesis. One study revealed that an increased number of neuropeptides in the brain could be responsible for neurogenic inflammation in ASD pathogenesis [29].

The correlation between camel milk consumption and protection against inflammation [30], hepatotoxins, carcinogens [31], diabetic complications, autoimmunity, and multiple sclerosis associated with ASDs [32, 33] has increased the global demand for camel milk products [34]. Multiple studies have examined camel milk as a potential alternative and supplemental therapy for ASDs. To assess this body of work, we performed a meta-analysis of randomized controlled trials (RCTs) on the use of camel milk to treat various CNS conditions. Our results reveal that patients treated with raw or boiled camel milk had lower Childhood Autism Responsiveness Scale (CARS) scores, indicating that camel milk may reduce neuroinflammation or autoimmunological responses associated with ASDs.

2. Materials and Methods

2.1. Objectives. In accordance with guidelines established by the Preferred Report Items for Systematic Review and Meta-Analysis (PRISMA), a PICO (Population, Intervention, Comparison, and Outcomes) strategy was employed to analyze the contribution of camel milk consumption to reductions in ASD-associated behaviors as measured by CARS.

2.1.1. Population. The meta-analysis included patients diagnosed with autistic spectrum disorders (ASDs).

2.1.2. Intervention. The intervention was the administration of raw or boiled camel milk and cow milk (as a placebo) in ASD patients. CARS scores were measured before, immediately following, and two weeks after administration in all the RCTs included in this meta-analysis.

2.1.3. Benefit Comparison. We compared the benefits associated with camel milk administration in ASD treatment using the following measurements: CARS and vasoactive intestinal peptide (VIP) scores; blood plasma concentrations of myeloperoxidase, superoxide dismutase, and glutathione; serum levels of thymus and activation-regulated chemokines (TARC); and the autism evaluation checklist.

2.2. Search Strategy. The Cochrane Database of Systematic Reviews, EMBASE, PubMed, and Web of Science medical databases were searched for RCTs. There was an electronic search for any active clinical trials on the topic. Other potential studies were also found using the Google Scholar search engine. Cited references within the peer-reviewed journal articles were also searched manually.

Keywords indicated the search approach. We extracted literature from 2000 to 2022 using a search method including the English language and chronological filters. The following search terms were used to generate eligible literature: camel milk, CNS diseases, autism, or ASDs.

2.3. Eligibility Criteria

2.3.1. Inclusion Criteria. Studies with abstracts and articles included in the meta-analysis met the following inclusion criteria: (1) reported risk estimates, (2) provided novel research results or included RCTs, (3) conducted no earlier than the year 2000, (4) detailed CNS diseases, and (5) reported in the English language.

2.4. Study Selection and Data Synthesis. Two researchers conducted a standardized and systematic review of the relevant available data. Each analyzed database was utilized in conjunction with the inclusion criteria to determine if an abstract was included or omitted from consideration. Each researcher selected and reviewed individually the full-length papers that were accepted for consideration. In cases where the primary author’s information could not be obtained, the chief researcher validated the discrepancies independently. After reaching a consensus, any conflicts that arose were analyzed and resolved to provide data with the greatest degree of transparency.

2.5. Data Analysis. Data derived by a thorough search of the medical databases for eligible criteria were tabulated in the study identification. The country in which each study was conducted and other demographic characteristics of the
included studies were included in the analysis. Perceived outcomes from each study were also included in the tabulated file, showing all relevant characteristics of each study.

Since all included studies included data from RCTs, a meta-analysis was conducted using the Cochrane tool for systematic reviews and meta-analysis. An inverse variance weighted random model was utilized to calculate the risk ratio using a 95% confidence interval of dichotomous data and a standard mean difference of continuous data. Heterogeneity was also measured for all expected outcomes, with results of $p < 0.05$ considered statistically significant.

2.6. Risk of Bias. The efficacy of an intervention might be underestimated or overstated due to flaws in RCT design, methodology, analysis, and reporting. The technique developed by the Cochrane Collaboration to measure bias risk attempts to make the process more transparent and accurate [35]. To reduce bias, we employed obsfuscated randomization, explicit inclusion and exclusion procedures, the blinding of the study, individual screening, blinded data processing, and intention-to-treat analysis. The total risk of bias in the studies was assessed using the Cochrane Handbook Tool for Risk of Bias [35]. The studies were categorized as demonstrating a high, low, or uncertain probability of being biased. Data from sequence construction, allocation concealment, participant, staff, and result assessor blinding, inadequate data, selective outcome reporting, and other risks were included in the overall risk of summary bias (Figure 1).

3. Results

We identified 400 eligible published and gray literature studies in several medical databases on the benefits of treating CNS diseases with camel milk. Forty-five studies included animal trial data, 54 were case reports, systematic reviews, and meta-analyses, 60 focused on alternate conditions, and 30 and 70 studies reported only on care and management and nonoral feeding, respectively.

Further stratification of the available literature yielded 24 studies. Careful analysis of the extracted literature resulted in excluding six studies as they were not RCTs. An additional 15 studies were excluded as they focused on other diseases. Finally, four studies were selected for a systematic review and a meta-analysis (Figure 2). A summary of study characteristics, comprising the study ID, design, population, duration, and outcomes, is provided in Table 1. Forest-plot analyses of the results are provided in Figures 3–5.

A comparison of the different levels of responsiveness in these groups revealed a mean difference (MD) of $1.99 (0.89, 3.08)$ in the ASD intervention group treated with boiled camel milk, $MD = [2.77 (1.92, 3.61)]$ in the ASD intervention group treated with raw camel milk, and $MD [1.02 (−0.10, 2.13)]$ in the cow milk group. The investigated studies demonstrated a low level of heterogeneity. Treatment of ASD with raw and boiled camel milk resulted in significantly lower CARS scores than the placebo.

4. Discussion

ASD is now generally recognized as a complex, widespread, heterogeneous syndrome with multiple etiologies, subtypes, and developmental paths. Despite significant social and economic consequences, there are few treatment options for ASD symptoms, which include both diagnostic criteria-related symptoms and those thought to be a result of comorbid mental and medical problems that enhance presentation severity. Researchers have identified camel milk as an effective treatment intervention for ASD in children, especially in the Middle East, where camel milk products are in high demand by consumers. Camel milk may provide an alternative ASD treatment as it is more tolerated than the milk of other ruminants [13]. The results of our meta-analysis highlight the need for broader, more populated RCTs investigating camel milk as an ASD therapeutic.

An analysis of data presented by the included studies in this work shows marginally lower behavioral CARS scores ($p = 0.007$) in patients treated with raw or boiled camel milk. This trend is mainly attributed to the ability of camel milk to significantly decrease neuroinflammation and autoimmune reactions [10, 11, 32, 36]. ASD is a life-long condition characterized by an impairment in communication and social interaction [37]. Studies into the causes of ASD have revealed that oxidative stress is a critical risk factor in developing autoimmunity. The vitamin C concentration in camel milk, uniquely higher than other milk products, may be responsible for the antioxidant properties [38]. The availability of many antioxidant vitamins A, C, and E and elevated concentrations of zinc and magnesium minerals in camel milk justifies its use as an antioxidant intervention in ASD patients [19]. Camel milk is also unique in its glutathione and antioxidant mineral concentrations. In the studies included in our meta-analysis, increased blood plasma glutathione, superoxide dismutase, and myeloperoxidase concentrations were observed in ASD patients after consuming camel milk for two weeks. These observations demonstrate the overall therapeutic potential of camel milk consumption due to the reduction of oxidative stress via changes in the concentrations of antioxidative enzymes and nonenzymatic antioxidant molecules [39].

Camel milk has a different casein protein distribution than cow milk, with a lower proportion of A1 $\beta$-casein. This casein breaks down into its peptide components, including BCM-7, an active opioid that may seep through a person’s “leaky gut” and reach the brain, potentially impairing social interaction in ASD patients [40, 41].

Adams (2013) presented a case report on the efficacy of camel milk for the treatment of ASD in children [42]. After consuming camel milk, the patient displayed a significant improvement in the phenotypic ASD manifestations. These changes were highlighted by an “improvement in eye contact, communication, emotional expressions, and self-organization.” Notably, after consuming camel milk for three weeks, the patient exhibited significant improvements in behavior modification, motor function, language, and academic skills and planning, a decreased irritability score and erratic behavior, and improved skin condition. Furthermore, interruptions in
camel milk intake resulted in behavioral and physiological impairments and the patient’s return to erratic behavior, which decreased when camel milk consumption was resumed.

The strong association between ASD and gastrointestinal difficulties, as manifested in most individuals with ASD, challenges the effective digestion of most milk protein as presented in cow (but not camel) milk. The form of milk protein casein and IgG and IgA immunoglobulins in camel milk also contribute to its potential in ASD intervention. As the immunoglobulins present in camel milk are smaller, they

---

**Figure 1:** The risk of summary biases reported in the RCTs.

**Figure 2:** Flowchart of the literature search process and results.
can more effectively penetrate tissues and cells than larger cow milk immunoglobulins [43].

4.1. Strengths and Limitations. This meta-analysis assessed the growing and sometimes conflicting data on the influence of camel milk on ASD. We faced several challenges in drafting a full systematic review and meta-analysis. First, research on camel milk treatment of CNS diseases such as ASD is a new field of study. Knowledge of its treatment potential may only be available where camels are abundant, such as in the Middle East, North Africa, and some parts of West and East Africa. This limitation resulted in a very small number of RCTs available for inclusion in this meta-analysis.
The findings of this study indicate that several critical components of camel milk may help improve ASD symptoms and the autistic patient’s quality of life. The unique composition of camel milk, including protective proteins, vitamins, essential mineral ions such as zinc and magnesium, and small immunoglobulins, similar to those found in human breast milk, is a major factor in its growing popularity as a treatment intervention for a variety of conditions. However, evidence from RCTs emphasizing the possible advantages of camel milk consumption remains sparse. Consequently, we propose that longer, more populated RCTs are needed to evaluate these potential benefits. Results derived from the systematic review and meta-analysis highlight some essential components of camel milk aimed at improving ASD diseases and the quality of life of an autistic individual. The unique composition of camel milk with protective proteins, vitamins, essential nutritional mineral ions such as zinc and magnesium, and small immunoglobulins, similar to those found in human breast milk is a major contributing factor to the rise in popularity of camel milk as a treatment intervention for a number of diseases. However, data from randomized clinical trials highlighting the potential benefits remain limited; thus, we advocate for longer, more populated RCTs to carefully examine these benefits.

### Data Availability

The data used to support the findings of this study are included within the article.

### Conflicts of Interest

The authors declare no conflicts of interest.
Acknowledgments

The authors acknowledge the Deanship of Scientific Research, Vice Presidency for Graduate Studies and Scientific Research, King Faisal University, Saudi Arabia (Project no. GRANT664). This work was supported by the Deanship of Scientific Research, Vice Presidency for Graduate Studies and Scientific Research, King Faisal University, Saudi Arabia (Project no. GRANT664).

References

[1] E. Seifu, A. Angassa, and W. S. Boitumelo, "Community-based camel ecotourism in botswana: current status and future perspectives," *Journal of Camelid Science*, vol. 11, 2019.

[2] M. Kandeel, B. K. Park, M. A. Morsy et al., "Virtual screening and inhibition of middle east respiratory syndrome coronavirus replication by targeting papain-like protease," *Dr Sulaiman Al Habib Medical Journal*, vol. 3, no. 4, pp. 179–87, 2021.

[3] I. K. Ohobo, S. M. Tomczyk, A. M. Al-Asmari et al., "2014 MERS-CoV outbreak in Jeddah--a link to health care facilities," *New England Journal of Medicine*, vol. 372, no. 9, pp. 846–854, 2015.

[4] M. Peiris and S. Perlman, "Unresolved questions in the zoonotic transmission of MERS," *Current Opinion in Virology*, vol. 52, pp. 258–264, 2022.

[5] R. Agrawal, M. Sahani, F. Tutteja et al., "Hypoglycemic activity of camel milk in chemically pancreatectomized rats—an experimental study," *International Journal of Diabetes in Developing Countries*, vol. 25, no. 3, pp. 75–79, 2005.

[6] R. P. Agrawal, R. Beniwal, D. K. Kochar et al., "Camel milk as an adjunct to insulin therapy improves long-term glycemic control and reduction in doses of insulin in patients with type-1 diabetes A 1 year randomized controlled trial," *Diabetes Research and Clinical Practice*, vol. 68, no. 2, pp. 176-177, 2005.

[7] R. H. Mohamad, Z. K. Zekry, H. A. Al-Mehdar et al., "Camel milk as an adjuvant therapy for the treatment of type 1 diabetes: verification of a traditional ethnomedical practice," *Journal of Medicinal Food*, vol. 12, no. 2, pp. 461–465, 2009.

[8] H. Saltanat, H. Li, Y. Xu, J. Wang, F. Liu, and X. H. Geng, "The influences of camel milk on the immune response of chronic hepatitis B patients," *Chinese Journal of Cellular and Molecular Immunology*, vol. 25, no. 5, pp. 431–433, 2009.

[9] E. R. M. Redwan and A. Tabli, "Camel lactoferrin markedly inhibits hepatitis C virus genotype 4 infection of human peripheral blood leukocytes," *Journal of Immunoassay and Immunochemistry*, vol. 28, no. 3, pp. 267–277, 2007.

[10] S. Bashir and L. Y. Al-Ayadhi, "Effect of camel milk on thymus and activation-regulated chemokine in autistic children: double-blind study," *Pediatric Research*, vol. 75, no. 4, pp. 559–563, 2014.

[11] L. Y. Al-Ayadhi, D. M. Halepoto, A. M. Al-Dress, Y. Mitwali, and R. Zainah, "Behavioral benefits of camel milk in subjects with autism spectrum disorder," *Journal of College of Physicians and Surgeons Pakistan*, vol. 25, no. 11, pp. 819–823, 2015.

[12] D. Kumar, A. K. Verma, M. K. Chati et al., "Camel milk: alternative milk for human consumption and its health benefits," *Nutrition & Food Science*, vol. 46, 2016.

[13] S. Zibaee, S. M. A. R. Hosseini, M. Yousefi, A. Taghipour, M. A. Kiani, and M. R. Noras, "Nutritional and therapeutic characteristics of camel milk in children: a systematic review," *Electronic Physician*, vol. 7, no. 7, pp. 1523–1528, 2015.

[14] R. Krishnankutty, A. Iskandarani, L. Therachiyil et al., "Anticancer activity of camel milk via induction of autophagic death in human colorectal and breast cancer cells," *Asian Pacific Journal of Cancer Prevention*, vol. 19, no. 12, pp. 3501–3509, 2018.

[15] T. Mohammadabadi, "Camel milk as an amazing remedy for health complications: a review," *Basrah Journal of Agricultural Sciences*, vol. 33, no. 2, pp. 125–137, 2020.

[16] M. H. Yassin, M. M. Soliman, S. A.-E. Mostafa, and H. A.-M. Ali, "Antimicrobial effects of camel milk against some bacterial pathogens," *Journal of Food and Nutrition Research*, vol. 3, no. 3, pp. 162–168, 2015.

[17] R. P. Agrawal, P. Tantia, S. Jain, R. Agrawal, and V. Agrawal, "Camel milk: a possible boon for type 1 diabetic patients," *Cellular and Molecular Biology*, vol. 59, no. 1, pp. 99–107, 2013.

[18] A. Abirhaley and S. Leta, "Medicinal value of camel milk and meat," *Journal of Applied Animal Research*, vol. 46, no. 1, pp. 552–558, 2018.

[19] Y. Galali and H. Al-Dmoo, "Miraculous properties of camel milk and perspective of modern science," *Journal of Family Medicine and Disease Prevention*, vol. 5, no. 1, pp. 1–7, 2019.

[20] K. Jilo, "Medicinal values of camel milk," *International Journal of Veterinary Sciences Research*, vol. 2, no. 1, pp. 18–25, 2016.

[21] F. Teng, P. Wang, L. Yang, Y. Ma, and L. Day, "Quantification of fatty acids in human, cow, buffalo, goat, yak, and camel milk using an improved one-step GC-FID method," *Food Analytical Methods*, vol. 10, no. 8, pp. 2881–2891, 2017.

[22] L. Hambraeus, "Importance of milk proteins in human nutrition: physiological aspects," *Milk proteins*, vol. 84, pp. 63–79, 1985.

[23] C. Gillberg and J. Wahlström, "Chromosome abnormalities in infantile autism and other childhood psychoses: a population study of 66 cases," *Developmental Medicine and Child Neurology*, vol. 27, no. 3, pp. 293–304, 1985.

[24] E. Edmiston, P. Ashwood, and J. Van De Water, "Autoimmunity, autoantibodies, and autism spectrum disorder," *Biological Psychiatry*, vol. 81, no. 5, pp. 383–390, 2017.

[25] H. Jyonouchi, S. Sun, and N. Itokazu, "The influences of camel milk on the immune response of chronic hepatitis B patients," *Chinese Journal of Cellular and Molecular Immunology*, vol. 25, no. 5, pp. 431–433, 2009.

[26] G. Bjørklund, N. A. Meguid, M. A. El-Bana et al., "Oxidative stress in autism spectrum disorder," *International Journal of Food and Nutrition Sciences*, vol. 5, no. 1, pp. 1–7, 2019.

[27] H. A.-M. Ali, "Antimicrobial effects of camel milk against some bacterial pathogens," *Journal of Family Medicine and Disease Prevention*, vol. 372, no. 9, pp. 846–854, 2015.

[28] A. Abrhaley and S. Leta, "Medicinal value of camel milk and perspective of modern science," *Journal of Family Medicine and Disease Prevention*, vol. 5, no. 1, pp. 1–7, 2019.

[29] T. C. Oharides, D. Kempuraj, and L. Redwood, "Autism: an emerging "neuroimmune disorder" in search of therapy," *Expert Opinion on Pharmacotherapy*, vol. 10, no. 13, pp. 2127–2143, 2018.

[30] T. Mihic, D. Rainkie, K. J. Wilby, and S. A. Pawluk, "The therapeutic effects of camel milk: a systematic review of animal and human trials," *Journal of Evidence-Based
Complementary & Alternative Medicine, vol. 21, no. 4, pp. NP110–NP126, 2016.

[31] M. A. Hamzawy, Y. B. El-Ghandour, S. H. Abdel-Aziem, and Z. H. Ali, "Leptin and camel milk abate oxidative stress status, genotoxicity induced in valproic acid rat model of autism," International Journal of Immunopathology & Pharmacology, vol. 32, Article ID 2058738418785514, 2018.

[32] L. Y. Al-Ayadhi, N. E. Elamin, and A. Shaik, "Camel milk as a potential therapy as an antioxidant in autism spectrum disorder (ASD)," Stress, vol. 10, p. 13, 2015.

[33] A. R. Hammam, "Compositional and therapeutic properties of camel milk: a review," Emirates Journal of Food and Agriculture, vol. 31, pp. 148–152, 2019.

[34] A. R. Hammam, "Compositional and therapeutic properties of camel milk: a review," Emirates Journal of Food and Agriculture, vol. 31, pp. 148–152, 2019.

[35] M. Faccia, A. G. D’Alessandro, A. Summer, and Y. Hailu, "Milk products from minor dairy species: a review," Animals, vol. 10, no. 8, p. 1260, 2020.

[36] J. P. T. Higgins, D. G. Altman, P. C. Gotzsche et al., “The cochrane collaboration’s tool for assessing risk of bias in randomised trials,” BMJ, vol. 343, Article ID d5928, 2011.

[37] G. A. Mostafa, G. Bjørklund, and L. A. Ayadhi, "Therapeutic effect of camel milk in children with autism: its impact on serum levels of vasoactive intestinal peptide," International Journal of Medical Science and Clinical Invention, vol. 8, no. 10, pp. 5698–5707, 2021.

[38] C. T. Nguyen, D. L. Fairclough, and R. B. Noll, "Problem-solving skills training for mothers of children recently diagnosed with autism spectrum disorder: a pilot feasibility study," Autism, vol. 20, no. 1, pp. 55–64, 2016.

[39] M. Z. Khan, J. Xiao, Y. Ma et al., "Research development on anti-microbial and antioxidant properties of camel milk and its role as an anti-cancer and anti-hepatitis agent," Antioxidants, vol. 10, no. 5, p. 788, 2021.

[40] R. J. Wako, G. D. Ano, and A. G. Amejo, "The role of camel milk and milk products, in household diet and therapeutic advancement: a review," American Journal of Biomedical and Life Sciences, vol. 8, no. 3, pp. 60–63, 2020.

[41] L. Al-Ayadhi, A. M. Alhowikan, R. Bhat, and A. El-Ansary, "Comparative study on the ameliorating effects of camel milk as a dairy product on inflammatory response in autism spectrum disorders," Neurochemical Journal, vol. 16, no. 1, pp. 99–108, 2022.

[42] R. Wernery, S. Joseph, B. Johnson et al., "Camel milk against autisma preliminary report," Journal of Camel Practice and Research, vol. 19, no. 2, pp. 143–147, 2012.

[43] C. M. Adams, “Patient report: autism spectrum disorder treated with camel milk," Global Advances in Health and Medicine, vol. 2, no. 6, pp. 78–80, 2013.

[44] Y. Shabo and R. Yagil, "Etiology of autism and camel milk as therapy," International Journal on Disability and Human Development, vol. 4, no. 2, pp. 67–70, 2005.