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Systematic Review

Physiotherapy management in patients with pleural effusion: a systematic review

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ABSTRACT

Pleural effusion is the accumulation of fluid in between the parietal and visceral pleura, which is called the pleural cavity. It can occur by itself or can be the result of surrounding parenchymal disease like infection, malignancy, or inflammatory conditions. Pleural effusion is one of the major causes of pulmonary mortality and morbidity. With the aim to review the physiotherapy management in pleural effusion till date A Systematic review was done according to PRISMA guidelines was conducted on 15 articles through different databases like PubMed, google scholar which were identified, sorted, and screened according to the inclusion criteria and exclusion criteria post which the studies were assessed for quality. In this review the result data from the selected studies were extracted under the headings of title/author, type of study design, intervention /device /technique elaborated in the study, and key highlights of the study and was tabulated systematically. Following the discussion of results about the methods, effects of the protocols along with the biases in research it was concluded that Physiotherapy management increases pulmonary function, chest expansion and oxygenation in patients with pleural effusion.

Keywords: Pleural effusion, Physiotherapy management, Respiratory physiotherapy

INTRODUCTION

Pleural effusion is the accumulation of fluid in between the parietal and visceral pleura, called the pleural cavity. It can occur by itself or can be the result of surrounding parenchymal disease like infection, malignancy, or inflammatory conditions. Pleural effusion is one of the major causes of pulmonary mortality and morbidity.[1]

A tiny quantity of pleural fluid, which lubricates the area and supports normal lung movements during respiration, is present in every healthy human. Oncotic and hydrostatic pressure, lymphatic drainage, and this delicate fluid equilibrium are all kept in check by these systems, and any disruption in one of them can cause pleural fluid to accumulate.[1]

Various procedures may be used to treat pleural effusions, including: Thoracentesis, Tube thoracotomy, Pleurodesis, Pleural drain and Pleural decortication.[2] Physiotherapy can be beneficial in managing pleural effusion, which is an accumulation of fluid in the pleural space surrounding the lungs. The following are some of the potential effects of physiotherapy in pleural effusion: Improve breathing: Physiotherapy can help to improve breathing by facilitating the removal of excess fluid in the pleural space.[3]

Reduce pain and discomfort

Pleural effusion can cause pain and discomfort, especially during breathing. Physiotherapy can help to alleviate

these symptoms by reducing inflammation and promoting drainage of the fluid.

Prevent complications

In severe cases of pleural effusion, the accumulation of fluid can cause the lung to collapse or lead to infection. Physiotherapy can help to prevent these complications by promoting lung expansion and improving drainage of the fluid.[4]

Improve mobility and function: Patients with pleural effusion may experience reduced mobility and function due to pain and shortness of breath. Physiotherapy can help to improve these aspects by promoting lung function and restoring muscle strength.[4] Goals are usually set according to the symptoms found in the patient of pleural effusion. Some of the common goals of physiotherapy in pleural effusion are to improve cardiopulmonary function, to prevent further cardiopulmonary complication and to improve fatigability and cardiopulmonary endurance.

The major treatment options for pleural effusion can be fluid drainage through a chest tube and therapy of your underlying disease. Physiotherapy plays a critical function in helping to drain chest fluid and eliminate secretions from the chest, as well as stabilizing and regulating respiration. Individuals who undergo respiratory physiotherapy as part of their care typically recover more quickly and with fewer problems. Physiotherapy offers a variety of therapeutic approaches, such as secretion clearance including productive and successful coughing methods, when lying down or sitting, postural drainage, manual support, such as shaking, vibrating, and pounding, and Retraining breathing techniques including regulating breathing rate, breathing diaphragmatically, regulating or lowering the volume of breath, and breathing exercises for relaxation.

Instruction and Guidance include cause and course of illness**,** effects of allergens and the environment**,** medication administration.[4]

Overall, physiotherapy can be a valuable adjunct to medical management in patients with pleural effusion. It can help to improve breathing, reduce pain and discomfort, prevent complications, and improve mobility and function. However, the specific techniques used will depend on the individual patient's condition and the underlying cause of the pleural effusion.[4]

Objective of the study was to discover the various physiotherapy management used till present for Pleural effusion along with the outcomes and effects of the management on the condition.

METHODS

Study design

This was a systematic review.

Data extraction

Articles from eligible search engine including PUBMED and Google scholar using key words such as “pleural effusion” “physiotherapy management”, “respiratory physiotherapy” from August 2023- February 2024.

Study place

The place of the study was Dr. A.P.J Abdul kalam College of Physiotherapy, Pravara Institute of Medical sciences. We followed Prisma scale, preferred reporting-items for systematic reviews and meta-analyses (Prisma) standards for systematic reviews and meta-analyses in its design and reporting on how the study was carried out. We searched articles using search engines PubMed, google scholar using key words as pleural effusion, physiotherapy management, respiratory physiotherapy.

The articles were searched according to the inclusion and exclusion criteria of the study.

Inclusion criteria

Inclusion criteria were full text articles, case control study, prospective study, retrospective study, observational study, cross sectional study, controlled clinical trial, and pre and post study.

Exclusion criteria

Exclusion criteria were articles with only abstracts, studies containing no original data, articles in other than English language, and unpublished articles.

RESULTS

It was observed that over all the physiotherapy intervention had significant difference in the result of their respective research.

Table 1: Summary.

Reference	Study design	Treatment strategies	Outcome measures	Results
G Valenza-Demet, MC Valenza et al	A randomized controlled trial	Limb exercises (passive, active assisted and Active) Pursed lips breathing Active expiration Incentive	Spirometry chest radiographs	The intervention group showed a significant pre-to-post hospital stay improvement (p<0.001). in

Continued.

Reference	Study design	Treatment strategies	Outcome measures	Results
		spirometry		Student's t- test showed a significant difference between groups in length of hospital stay, being shorter in the physiotherapy group.
Sambhaji B. Gunjal, Nisha K. Shinde et al	Comparative study	Deep breathing exercises segmental breathing exercises	Chest expansion measure pulmonary function	The result of segmental breathing group was more effective than the deep breathing group.
Komal Agarwal, Subin Solomen et al (2016)	Comparative study	Chest mobility exercises with Incentive spirometry according to guidelines given by Kisner (Milojević, 2003) and the AARC (AARC Clinical Practice Guideline. 1991). Chest mobility exercises with Stacked breathing according to guidelines given by Kisner (Milojević et al., 2003) and breath stacking technique explained by Providence Care	Chest expansion	According to the study's findings, patients with unilateral pleural effusion showed improved chest expansion with both approaches being equally successful.
Caleb Ademola Omuwa, Tololope Oluwatobiloba et al. (2016)	A randomized controlled trial	Sustained maximal inspiration, coughing and huffing, incentive spirometer,	Systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), and pulse pressure (PP) forced vital capacity (FVC) and the forced expiratory volume inone second (FEV1) with the use of a spirometer. The oxygen hemoglobin saturation (SpO2) was assessed using a non- invasive pulse oximeter.	In patients who have had thoracic and/or abdominal surgery, either incentive-spirometry or specific chest Physiotherapy techniques are useful in improving lung and cardiovascular functions and preventing complications; however, the combination of both techniques is clinically more effective.
Elinaldo da Conceiçãodos Santos, Juliana de Souza da Silva etal. (2016)	A randomized controlled trial	Incentive spirometry, airway clearance manoeuvres, using a high-frequency oscillator, breathing with CPAP of 4 cm H2O (sham)18 via an oronasal mask attached to a bedside ventilation unit for 5 minutes while sitting on a chair; and walking a distance of 100metres. CPAP of 15 cmH2O (active)18 via an oronasal mask attached to a bedside ventilation unit for 30 minutes while sitting on a chair	Duration of thoracic drainage, quantified in days until drain removal, Pulmonary function test by spirometry	Length of hospital stay was shorter in the Exp2 group when compared with the other groups. The Exp2 group experienced fewer pulmonary problems than both the Con group and the Exp1 group.
Dr. Humaira	A randomized	Diaphragmatic breathing,	Borg scale	Respiratory rate and

Continued.

Reference	Study design	Treatment strategies	Outcome measures	Results
Ansari1, Dr. Shreya Dhake et al (2017)	controlled trial	thoracic expansion exercises pursed lip breathingPEP therapy	SpO2 (using pulse oximeter), respiratory rate (for a minute), chest expansion	oxygen saturation was higher in the group receivingconventional along with PEP therapy.
Seyed Tayeb Moradian, Mohammad Najafloo et al (2017)	A randomized controlled trial	Sitting on the edge of the bed and dangling legsStanding next to the bed Walk 30meter	Arterial blood gasChest radiographs	The results of this study showed that the intervention grouphad a lower incidence of pleural effusion and a betteroxygenation compared to the control group. This intervention could be a safe part of routine care in CABG
Dipali Rana, Neepa Pandya (2019)	Experimental, crossover design	Forced expiratory maneuver in sitting, right and left lateral decubitus positions	FVC forced expiratory volume in 1 second (FEV1) FEV1/FVC	No significant difference ($p>0.10$) was noted in FVC, FEV1 and FEV1/FVC values between the three positions.
Rinkle Parmar, Prajakta Sahasrabud et al (2019)	A randomized controlled trial	Pursed lip breathing (18-20 reps) Segmental breathing (18-20 breaths /session with frequency of 6 breaths/minute), positioning to facilitate fluid drainage with ICD site down, active limb mobilization and patient education on ICD sitecare once in a day for 5 days. The experimental groupreceived Conventional TENS (frequency =80 Hz, intensity=as tolerated by the patient, two electrodes placed around the ICD site) for 15 minutes in 5addition traditional physiotherapy treatment once in a day for 5 days.	Measures of pain and dyspneaon 10-point Visual analogue scale (VAS) and chestexpansion at 4th intercostal space with centimeter tape were taken	Based on the results of this study, conventional TENS can be used in addition to standard physiotherapy to reduce pain,increase chest expansion, and relieve dyspnea.
Gurman Kaur, SatishKumar Anumula et al. (2020)	Case study	Range of motion exercises, active antigravity and trunk exercises, incentive spirometry, positive airway pressure standing, deep breathing exercises, ambulation	Pulmonary function test	When treating patients with post-operative pleural effusion in a sub-intensive care setting, positive airway pressure proved a safe, practical, and simple therapy strategy.
volodymyr vitomskyi etal (2020)	Retrospective analysis	Early mobilization protocols: sitting on the bed, standing, on-the-spot walking, walking within the ward walking in the hospital corridor extra early mobilization protocols: sitting on the edge of the bedwith legs dangling, standing, on-the-spot walking, walking within the	Ultrasound findings	Study revealed no differences between extra earlymobilization and early mobilization groups

Continued.

Reference	Study design	Treatment strategies	Outcome measures	Results
		ward walking in the corridor on the 2–3rd PODs and performing therapeutic exercises with a PT. Inspiratory muscle training tapping massage techniques to stimulate sputum expectoration and promote motor activity.		
Timuçin Alar, Ismail Ertuğrul Gedik et al. (2020)	A randomized controlled trial	Analgesic treatment, incentive spirometry, triflow device, postural drainage and chest percussion maneuvers	Chest radiographs	Patients who had three or more RF were more likely to get delayed hemothorax after receiving chest physical therapy. Patients should receive chest physical therapy, but it must be done carefully. because to the potential dangers, with three or more RF in hospital settings.
Minhaj Tahir, Tahzeeb Fatima et al (2021)	Comparative study	Chest mobility exercises with incentive spirometry and the AARC received Chest mobility exercises with stacked breathing according to guidelines given by Kisner (Milojeviæ et al., 2003) and breath stacking technique explained by providence care.	Thoracic flow cytometry	According to the study's findings, participants with unilateral pleural effusion showed improved chest expansion with similar effectiveness from both procedures.
Nikita Kaple, Moli Jain et al (2022)	Case study	Guidance for the patient's caregivers. Dyspnea relieving positions positional changes and general relaxation. Jacobsons relaxation technique ACBT apical and lateral costal expansion, diaphragmatic breathing Breath stacking exercise Incentive spirometer exercise	FACIT-F (Functional Assessment of Chronic Illness Therapy-Fatigue) scale. dyspnoea grade (mMRC). Hospital Anxiety and Depression Scale (HADS).	Physiotherapy rehabilitation has proven to be quite effective for individuals receiving palliative care. The therapy has resulted in a considerable improvement in the patient's quality of life in addition to a decrease in symptoms.
Nidhi Tiwari, Ruhi Kumbhare Et al (2022)	Case study	Patient education bed side sitting diaphragmatic breathing pursed lip breathing exercises for thoracic expansion active range of motion for upper and lower limb incentive spirometer	Modified medical research council dyspnea scale visual. analog scale of dyspnea spirometer	Patient’s metrics improved with physical therapy rehabilitation

Deep breathing exercise, segmental breathing, thoracic expansion exercise, diaphragmatic breathing exercise, pursed lip breathing, huffing and coughing, breath staking, incentive spirometry, active cycle of breathing technique early mobilization post operation, use of conventional TENS, triflow device, Jacobson’s relaxation technique, positive expiratory airway pressure, sustained maximal inhalation and Dyspnea relieving positions have shown significant improvement in the treatment of pleural effusion. It was observed that there was no reporting bias in the above-mentioned results of the researches.

DISCUSSION

This systematic review is primarily aimed to provide an overview of the various physiotherapy management used and its effect on patients with pleural effusion. The findings of this review had been drawn from the above summarized 15 articles, which had information on effect of physiotherapy management on pleural effusion. According to the study conducted by Seyed Tayeb Moradian who examined the effect of Early Mobilization on the incidence of pleural effusion in patients who underwent CABG had found that the intervention group had a lower incidence of pleural effusion and had better oxygenation compared to the control group.[12] Another study which was done by Volodymyr Vitomskyi et al where they had determined the impact of including an extra early mobilization protocol on pleural effusion in patients undergoing cardiac surgical procedures. This retrospective analysis had determined the difference in the effect of early mobilization and extra early mobilization on pleural effusion. At the end of the study, it was observed that there was not significant difference found with the effect of extra early mobilization on pleural effusion. It is important to see that there wasn't any major difference in the protocol of both the groups except for the days, any different approach in technique for the extra early mobilization might have had helped the study to draw a difference in the result of their research. [11] A comparative study by Komal Agarwal et al was done where they had compared the effect of incentive spirometry and chest mobility exercises with chest mobility exercises and stacked breathing on chest expansion in subjects with unilateral pleural effusion. The study finds that in participants with unilateral pleural effusion, both approaches improved chest expansion equally well.[6] A similar study was done by Minhaj Tahir et al had compared the effect of incentive spirometry and chest mobility exercises with chest mobility exercises and stacked breathing on chest expansion in subjects with pleural effusion. The results were almost similar with the author concluding that in participants with unilateral pleural effusion, both treatments improved the chest expansion equally well.[9]

Elinaldo da Conceicao dos Santos et al did a controlled trial to see that adding positive airway pressure to mobilization and respiratory techniques hastens pleural drainage. In this study After receiving standard care, participants were randomized into three groups: a control group (Con), which also received sham positive airway pressure (4 cmH_2O); an experimental group (Exp1), which received the same sham positive pressure along with incentive spirometry, airway clearance, mobilization, and the same regimen (Exp2), which received the Exp1 regimen but with a positive airway pressure of 15 cmH_2O. For seven days, treatments were given three times a day. The study stated that positive pressure added to mobilization and respiratory treatments reduced hospital stays, length of thoracic drainage, pulmonary problems, use of antibiotics, and treatment expenses in patients with a fluid collection in the pleural space. The study has proved the importance of positive pressure added to the mobilization, the division of groups could have been kept as one with sham Positive pressure and other with positive airway pressure to simplify the study.[5]

A prospective study done by Timuçin Alar et al had aimed to study the effect of chest physiotherapy and analgesic therapy on the possible complications of isolated rib fractures attributable to blunt thoracic trauma, such as hemothorax and pneumothorax and pleural effusion. It was seen that chest physiotherapy was effective in prevention of late complication of hemothorax and pleural effusion in patients with more than three rib fractures and of patients of blunt TT.[13] A randomized controlled trial was done by Caleb Ademola Omuwa et al where the study compares the effectiveness of incentive breathing and specific chest physical therapy in enhancing lung and cardiovascular health and averting problems in patients who have undergone abdominal or thoracic surgery Including pleural effusion. It was seen that in patients who have had thoracic and/or abdominal surgery, either incentive-spirometry or specific chest physiotherapy techniques can improve cardiovascular and pulmonary functions and prevent complications; however, a combination of the two techniques is clinically more effective.[15] A case study conducted by Gurman Kaur et al was done on physiotherapy management for post operative complication of pleural effusion. This case study reveals the severe right ventricular dysfunction of a patient who underwent a heart transplant operation. Physiotherapy management had included range of motion exercises, active antigravity exercises, active trunk exercises, Incentive spirometry, positive airway pressure standing, deep breathing exercises and ambulation. In this case study, treating patients with post-operative pleural effusion in a sub-intensive care setting with positive airway pressure proved to be a safe, practical, and simple therapeutic strategy.[19]In an Experimental, crossover design done by Dipali Rana in the study each position, a forced expiratory maneuver was executed three times after the patient had rested as needed in between trials and after holding that posture for twenty minutes. It was ensured that participants comprehended the instructions and followed the standard guidelines (ATS Guidelines) when taking the test. The results had shown that there was no significant difference was noted in FVC, FEV1 and FEV1/FVC values between the three positions.[10]

Sambhaji B. Gunjal et al had conducted the study which was aimed to compare the effects of segmental versus deep breathing exercises on pulmonary function (FEV1, FVC IC) and chest expansion in patients with pleural effusion. the study concluded that, in cases of pleural effusion, segmental breathing exercises are more effective than deep breathing exercises at expanding the chest and improving lung function.[17] A case study was conducted by Nidhi Tiwari et al of physiotherapy

management for a chronic alcoholic patient with loculated pleural effusion. The treatment had consisted of bed side sitting, diaphragmatic breathing, pursed lip breathing, thoracic expansion exercises, incentive spirometer, active range of motion for upper and lower limb and ambulation. It was observed that patient's metrics improved with physical therapy rehabilitation.[18] A similar protocol was used by Dr Humaira Ansari et al where a conducted a randomized controlled trial in which the treatments included were diaphragmatic breathing, thoracic expansion exercises, pursed lip breathing and PEP therapy.

The results showed that Respiratory rate and oxygen saturation was higher in the group receiving conventional along with PEP therapy.[16] G Valenza-Demet et al did a randomized controlled study had also experimented with the protocol of limb exercises (passive, active assisted and Active), pursed lips breathing, active expiration and incentive spirometry for pleural effusion. More improvement was observed in every characteristic examined in the group receiving physiotherapy intervention, according to our findings.[7] Nikita kaple et al had done a case study on a patient With Pleural Effusion, Secondary to Metaplastic Breast Carcinoma. Pulmonary Rehabilitation and Palliative Care was given to the patient to see the outcome and effects of it on pleural effusion. The interventions included various physiotherapy intervention. Along with a reduction in of the symptoms, the therapy has significantly improved the patient's quality of life.[14] A controlled trial study was done by Rinkle Parmar et al to see the Effects of Conventional Transcutaneous Electrical Nerve Stimulation (TENS) on Pain, Dyspnea, and Chest Expansion in Patients with Pleural Effusion at the Intercostal Chest Drain (ICD) Site. The intervention included various previously discussed intervention along with TENS. The study finds that in patients with pleural effusion treated with chest drains, TENS, when combined with conventional physiotherapy, produces better benefits in reducing pain, dyspnea, and chest expansion.[8] The Systematic Review suggests that Physiotherapy treatments like deep breathing exercise, segmental breathing, thoracic expansion exercise, diaphragmatic breathing exercise, pursed lip breathing, huffing and coughing, breath staking, incentive spirometry, active cycle of breathing technique early mobilization post operation, use of conventional TENS, positive expiratory airway pressure, sustained maximal inhalation, triflow device, Jacobson's relaxation technique and Dyspnea relieving positions are effective in pleural effusion and cases of pleural effusion in post operative cases.

CONCLUSION

This study gives overview on many research and concluded that Physiotherapy management has significant effect on the treatment of pleural effusion. Physiotherapy management increases pulmonary function, chest expansion and oxygenation in patients with pleural effusion. It also reduces dyspnea and helps in prevention of pleural effusion as a post operative complication in various surgeries.

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REFERENCES

1. Krishna R, Rudrappa M. Pleural Effusion. In Star Pearls. 2024.
2. Jany B, Welte T. Pleural effusion in adults—etiology, diagnosis, and treatment. Deutsches Ärzteblatt International. 2019;116(21):377.
3. C. Michael Gibson, Prince Tano Djan, Nate Michalak, Pleural Effusion Epidemiology and Demographics.
4. Physiopedia,Pleural Effusion. Retrieved March 27, 2023, from https://www.physio-pedia.com/Pleural_Effusion. Accessed 15 February 2024.
5. Santos E, Vidal M, Silva J, Assis Filho M, Monte M, Lunardi AC. Non-invasive positive airway pressure added to chest physiotherapy promotes a faster resolution of pleural effusion after drainage. A randomised controlled trial. Eur Clin Respir J. 2016;48(60):4431.
6. Agarwal K, Solomen S. Comparative study between chest mobility exercises with incentive spirometry versus chest mobility exercises with stacked breathing on chest expansion in subjects with unilateral pleural effusion. Int J Dev Res. 2016;29(6):8034.
7. Valenza-Demet G, Valenza MC, Cabrera-Martos I, Torres-Sánchez I, Revelles- Moyano F. The effects of a physiotherapy programme on patients with a pleural effusion: a randomized controlled trial. Clinical rehabilitation. 2014;28(11):1087- 95.
8. Parmar R, Sahasrabudhe P, Shyam AK, Sancheti PK. Effect of Conventional Transcutaneous Electrical Nerve Stimulation (TENS) at Intercostal Chest Drain (ICD) Site in Patients with Pleural Effusion on Pain, Dyspnea and Chest Expansion. Int J Health Sci Res. 2019;1:167-72.
9. Tahir M, Fatima T, Trivedi D, Kumar M. Chest mobility exercise with staked breathing versus chest mobility exercises with incentive spirometery on chest expansion with pleural effusion patient: a comparative study. Int J Physiother Res. 2021;9(4):3949-53.
10. Rana D, Pandya N. Effect of Positioning on Pulmonary Functions in Unilateral pleural effusion. Indian J Physiother Occup. 2019;12(4):183–8.
11. Vitomskyi V. The impact of mobilization and other factors on pleural effusion in patients undergoing cardiac surgical procedures. J Phys Educ. 2020;20:2167-73.
12. Moradian ST, Najafloo M, Mahmoudi H, Ghiasi MS. Early mobilization reduces the atelectasis and

pleural effusion in patients undergoing coronary artery bypass graft surgery: a randomized clinical trial. Journal of Vascular Nursing. 2017;1;35(3):141-5.
13. Alar T, Gedik İE, Kara M. The effects of analgesic treatment and chest physiotherapy on the complications of the patients with rib fractures that arise from blunt chest trauma. Turkish Journal of Trauma & Emergency Surgery/Ulusal Travma ve Acil Cerrahi Dergisi. 2020;26(4):1-7.
14. Kaple N, Jain M, Yadav V, Bhakaney P. A Combat Journey with Pulmonary Rehabilitation and Palliative Care in a Patient With Pleural Effusion, Secondary to Metaplastic Breast Carcinoma. Cureus. 2022;21:14(10).
15. Gbiri CA, Oluwatobiloba T, Akinbo SR. Efficacy Of Chest-Physiotherapy And Incentive-Spirometry In Improving Cardiovascular And Pulmonary Functional Performances In Individuals Post-Thoraco-Abdominal Surgery: A Randomised Controlled Study. International Journal of Therapies and Rehabilitation Research. 2016;5(2):1.
16. Ansari H, Dhake S, Ahmed S. Positive expiratory pressure (PEP) therapy in patients with diseases of the pleura. Int J Health Sci Res. 2017;7:132-8.
17. Gunjal SB, Shinde NK, Kazi AH, Mahajan AA. Effectiveness of deep breathing versus segmental breathing exercises on chest expansion in pleural effusion. Int J Health Sci Res. 2015;5(7):234-40.
18. Tiwari N, Kumbhare R, Walke RR. Physical Therapy Rehabilitation for a Chronic Alcoholic patient with loculated pleural effusion. Cureus. 2022;16;14(10).
19. kaur AG. post operative pleural effusion and its PT management - A case study. Acta Scientific Orthopaedics. (2020):33-36.

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