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Original Article

Prevention and treatment of COVID-19 infection by earthing

Haider Abdul-Lateef Mousa

University of Basrah, College of Medicine, Ashar, Basrah, Iraq

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ABSTRACT

Background: Earthing is a body contact with earth without insulator. In previous studies, grounding revealed anti-inflammatory effect, immunity enhancement, anticoagulation, and rising blood oxygenation.

Aim: To investigate the role of earthing in treatment and prevention of COVID-19 infection.

Methods: An observational and interventional study included 71 cases with COVID-19 infection. Earthing was applied as preventive and treatment measures. All participants conducted earthing through direct contact with the earth or connecting apparatus for about 15 min to 6 h/day.

Results: Sixty-nine patients were fully improved within 2 h–11 days after commencement of earthing (mean: 2.9 days, SD \pm 2, median: 2 days), while the mean illness duration was 8.9 days (SD \pm 4.6) and the median was 9 days. Two patients with many risk factors died where earthing was carried out insufficiently and too late. Nine people contracted mild or short-lived illness (mean: 6.3 days, SD \pm 5.5) as a consequence of performing prophylactic earthing. There was a spectacular response in a critically ill patient who was unable to speak due to severe dyspnea with blood oxygen level 38% on continuous oxygen supply. On the second day, after two sessions of 3 h daily earthing, his oxygen level raised to 95% with oxygen supply and 77% without oxygen supply. The following symptoms were improved after implementing earthing: fever, dyspnea, cough, weakness, headache, chest pain, taste and smell sensation loss, anorexia, and body pain.

Conclusions: Earthing revealed significant curing and preventive effects with a shorter illness duration.

E-mail addresses: haider.mousa@uobasrah.edu.iq, haideramousa@hotmail.com, haideramousa@gmail.com.

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At a glance commentary

Scientific background on the subject

Earthing or grounding is direct or indirect human body contact with earth without electrical insulators that result in electron influx into the body. It has been confirmed that grounding reveals the following effects: anti-inflammation, enhancement a regular immune response, reduction of blood viscosity, and elevation of blood oxygen level.

What this study adds to the field

People who applied earthing as preventive measure for COVID-19 had contracted mild illness or even never acquired the illness. In patients with COVID-19, grounding produced a shorter illness duration, a rise in blood oxygen level in patients with hypoxemia, and temperature reduction. Earthing also relieved dyspnea, cough, weakness, headache, body pain, taste and smell sensation loss, and anorexia.

COVID-19 (SARS-CoV-2) is an RNA virus which frequently develops mutations [1]. There was a lot of controversy in regard to medications for COVID-19 infection such as antiviral drugs, hydroxychloroquine, steroids, and convalescent plasma. Vaccine development and production is still ongoing as a consequence of frequent viral mutations. There are many treatment modalities, although none of them prevent complications and death. Regarding steroid use, there is no conclusive evidence about its safety. It was used as anti-inflammatory agent for patients with COVID-19. Steroid administration in patients with COVID-19 was associated with increased death rate, secondary bacterial infections, and complications such as increased blood sugar, psychosis, delayed viral clearance, and raised mutation rate of the virus [2]. On the contrary, earthing has anti-inflammatory effect [3] and enhances immunity against respiratory viral infections as well [4,5]. Several studies have demonstrated the efficacy of certain antiviral agents for COVID-19 treatment. In preclinical studies on SARS-CoV and MERS-CoV infections, in COVID-19 patients, and in mice, remdesivir showed activity against the viral polymerase with subsequent premature termination of viral replication [6–8]. However, WHO does not approve the use of remdesivir in COVID-19 patients [9]. Recently, FDA has approved oral antiviral drugs for Pfizer's Paxlovid (nirmatrelvir tablets and ritonavir tablets), and Merck's molnupiravir for the treatment of mild-to-moderate coronavirus disease (COVID-19) [10,11]. Nirmatrelvir plus ritonavir was used for the treatment of symptomatic COVID-19. They reduced the risk of progression to severe COVID-19 by 89% lower than the risk in patients who were taking placebo [12]. It has been concluded that early administration of molnupiravir reduced the risk of death or hospitalization in unvaccinated at-risk adults with COVID-19 [13].

One reason for death in COVID-19 infection is suspected to be the "cytokine storm" [14]. Cytokine storm is an activation cascade of auto-amplifying cytokine production as a result of

dysregulated host immune response to different triggers among them are infections [15]. The proinflammatory cytokine, Interleukin-6, is a major mediator of acute inflammatory response and cytokine storm. Its level elevated above the normal range in patients with COVID-19 [16,17].

The earth's surface has an unlimited and constantly regenerated supply of free electrons. It is electrically conductive, and its electron supply is renewed by the global atmospheric electrical circuit [18,19]. It has been suggested that free or mobile electrons from the earth could improve chronic inflammation by favoring as natural antioxidants [20]. The effect is proposed by free electrons influx that absorbed into the body through direct contact with the earth probably neutralizes free radicals and, that way, minimizes acute and chronic inflammatory events [3]. A preprint published study also demonstrated that earthing produced alkaline pH medium in the respiratory tract. The alkaline medium reduced the ability of the pH-dependent coronaviruses to enter into respiratory epithelial cells [21]. Previously, it was recommended that earthing could be employed as a mean for prevention and treatment of respiratory viral infections [4,5,22]. It has been also suggested that early earthing might ameliorate the symptoms, help in recovery, and reduce complications of coronavirus infection [23].

The effects of earthing might have a substantial role in the management of patients with COVID-19 infection without deleterious side effects of ordinary medications. Therefore, the present study was carried out to investigate the role of earthing in prevention and treatment of COVID-19 infection. To the best of my knowledge, this is the first study that assessed the clinical outcome of COVID-19 infection after grounding application.

Patients and methods

The study was conducted in Basrah province during the period of May 28, 2020 to October 21, 2021. An observational-interventional study that was carried out on 71 patients with confirmed COVID-19 infection. It was regarded as an observational style in cases when the patients were already having the usual earth contact before and during infection with SARS-CoV-2, and as an interventional one in cases when the patients were instructed to perform earthing after contracting the illness. The diagnosis was confirmed by positive PCR results or chest CT-scan. All included patients were unvaccinated by any COVID-19 vaccine. The study was carried out before the emergence of Omicron variant. The research protocol was reviewed and approved by the Ethics Committee of the College of Medicine, University of Basrah, Iraq, under the Institutional Review Board at session number 15, 2020. Consent to participate was obtained from each patient or his or her guardian.

The patients were instructed to connect to the earth by several feasible means. The same instructions were also provided for some people who were in contact with patients as a preventive measure. Earthing was carried out by walking barefoot on non-insulated ground, preferably wet, or insertion of a conductive metallic bar in the earth that was connected with a conductive wire and plate to the patient's body. The body could be grounded by a conductive patch or earthing

sleep system on a bed's mattress that is connected to a building's earthing system. Contact with green plants, where their roots are directly inserted into the earth, is also regarded as a good earthing resource. House floors covered with ordinary construction cement, tiles, bricks, ceramic, granite, and marble are conductive, whereas wood, plastic, or carpet are regarded as non-conductive. It is recommended to connect the body to the earth directly or naturally, away from electrical interference from the building's systems or from the electrical apparatus [4].

Questionnaires were provided for patients that included symptoms, temperature, blood oxygen level if an oximeter was available, method and duration of earth connection, subjective feeling after earthing, and disease progression after earth connection during the next few days, Supplement 1. Laboratory investigations and chest CT-scan were also recorded for some patients. The progress of the disease was scrutinized by phone call follow-up or direct patient visit.

After earthing, the patients were instructed to record the signs and symptoms improvement or non-improvement such as temperature or blood oxygen level.

During earthing application, 49 patients were receiving medical treatment according to the severity of illness, while 22 patients were not taking any medication. They were instructed to not suspend any medication during the grounding application and consult their physicians as usual. The following medications were administered according to the patient's condition: oxygen supply, i.v. fluid, heparin, convalescent plasma, paracetamol, acetylsalicylic acid, azithromycin,

ceftriaxone, avifavir, oseltamivir, remdesivir, prednisolone, dexamethasone, vitamin C, Zinc, and vitamin D.

Additional 18 household people were investigated of whom 15 patients never had earthing before or during their illness. The other three people had earth contact as habitual barefoot walking at home who were living with infected family members. These 18 people were studied for comparison between people with and without earthing in regard to prevention, prognosis, and illness severity.

The research questions were developed into hard and soft copy questionnaires. The involvement of patients to participate in the study was carried out through announcements in the social media or direct contact with patients or their relatives. The patients or their advisers were involved in conducting earthing procedures and recruitment of other relative patients as well. They were asked to fill the questionnaires in response to the development of illness after conducting earthing. Direct communication by phone call or electronic message through social media was accomplished for people who had difficulty in writing a paper report. The assessment of the earthing intervention was achieved by interaction between the investigator and the patients or their relatives.

Results

Seventy-one patients were studied prospectively. Three patients were excluded from the study. Two women were instructed to perform earthing that were excluded because of

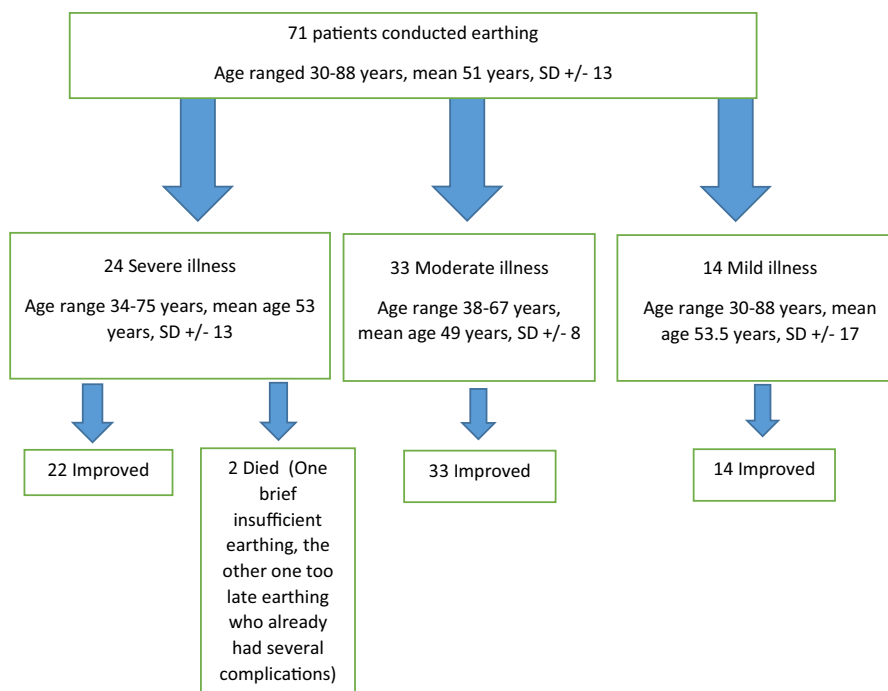


Fig. 1 The outcome of 71 patients with COVID-19 infection. Flowchart showing the outcome of 71 patients with COVID-19 infection after conducting earthing procedure. Twenty-four patients had severe illness of whom 22 patients were improved without any complications. Two patients with severe illness died because of late insufficient earthing that they were presented with many risk factors and complications. The other 47 patients with moderate and mild illness revealed full recovery after earthing.

lost follow-up. The third patient, a 73-year-aged man with severe illness who was complaining of critical dyspnea. He was on continuous oxygen supply and prescribed medications at home. He was excluded from the study because he refused applying an earthing apparatus to his body. Unfortunately, he died on the next day as a result of extreme hypoxemia while he was on the second week of illness.

The age of 71 patients ranged 30–88 years (mean 51 years, SD \pm 13). The illness was severe in 24 cases (age range 34–75 years, mean age 53 years, SD \pm 13), moderate in 33 cases (age range 38–67 years, mean age 49 years, SD \pm 8), and mild in 14 cases (age range 30–88 years, mean age 53.5 years, SD \pm 17), Fig. 1. The severity of illness was most likely related to early or late earthing application that even old age patients (85 and 88 years) got mild illness because of early onset earthing while other younger age patients got severe illness because of late onset earthing. The severity of illness was classified according to blood oxygen level, oxygen requirements, hospitalization, percentage of pulmonary involvement on CT-scan, and symptoms severity. Before contracting the illness, nine patients with confirmed infection were conducting regular earthing (barefoot walking) as a preventive measure or

habitual behaviour. They experienced mild symptoms or short duration illness (mean = 6.3 days, SD \pm 5.5), Table 1. Of whom, four patients experienced mild fever (one patient 7 h duration), two patients had productive cough, one patient had body pain and loss of taste and smell sensation, and one patient had weakness for just 2 h. Because of mild or short-lived illness, they did not receive any specific medications. Eighteen patients started early earthing within the first five days of the illness, full recovery was established within a mean duration of 3.7 days (SD \pm : 2.8) after earthing commencement, Table 2. Improvement was also noticed within a mean duration of 3 days (SD \pm : 1.7) after beginning earthing in nine patients with risk factors after performing earthing for about 1/2–3 h per day, Table 3. Sixty-seven year-aged diabetic patient at 3rd week of severe illness who was complaining of continuous fever, body pain, anorexia, and loss smell and taste sensation. A significant improvement on the second day by approximately 2 h daily grounding. There was settlement of fever and recovery of smell and taste sensations. All other patients with risk factors were improved significantly within one to six days after earthing commencement.

Table 1 Symptoms and illness duration in nine patients who performed prophylactic earthing.

Age/sex	Complaints	Earthing duration	Illness duration/day-hr
32 F	Fever	Prophylaxis ½ h/day for 7 days	5 d
58 M	Fever	Prophylaxis 1 h/day for 35 days	7 h (0.3 d)
59 M	Productive cough	Routine daily barefoot walking 2 h/day	14 d
47 F	Fever	Routine daily barefoot walking	2 d
49 M	Productive cough, runny nose	Routine daily barefoot walking	15 d
38 M	Body pain, loss of taste sensation & smell	Prophylaxis 15 min daily barefoot walking	4 d
44 M	Weakness	Prophylaxis 1 h/day	2 h (0.08 d)
67 F	Fever and cough	Routine daily barefoot walking	7 d
30 F	Loss of smell sensation, weakness & mild cough	Routine daily barefoot walking	9 d
Median: 5 days, Mean: 6.3 days, SD \pm 5.5			

Table 2 Recovery time after earthing in 18 patients who performed early earthing within the first five days of the illness.

Age/Sex	Complaints (duration)	Earthing duration	Recovery time after start earthing/day
45 M	Fever, headache, sore throat, anorexia, myalgia (4 days)	1 h/day	2
45 M	Fever, headache, body pain, anorexia, sore throat (5 days)	1 h/day	1
50 F	Fever, headache, cough (4 days)	45 min/day	3
40 F	Fever, chest pain, cough, dyspnea, weakness, (1 day)	2 h/day	10
59 M	Fever, rigor, sore throat (1 day)	3 h/day	1
57 M	Fever, weakness (4 days)	1 h/day	1
85 F	Fever, body pain (4 days)	40 min/day	2
88 M	Fever (3 days)	40 min/day	3
35 M	Fever, headache, body pain, weakness (5 days)	40 min/day for 2 days	2
55 F	Fever, dyspnea, weakness (3 days)	3–4 h/day	3
43 M	Dyspnea required oxygen supply (5 days)	½ h/day	8
61 F	Cough, dyspnea, loss of smell and taste sensation, weakness (3 days)	15–20 min/day for 7 days	9
40 M	Fever, cough, weakness (2 days)	½ h/day for 7 days	7
42 F	Fever, cough, body pain, weakness, rigor (4 days)	3 h/day	5
48 M	Weakness, tiredness (5 days)	15 min/day	2
57 M	Fever (5 days)	15 min/day	2
35 F	Fever, cough, dyspnea, weakness, loss of smell sensation (5 days)	1 h/day	3
38 F	Fever, weakness, body pain, dizziness, Headache, anorexia, cough (3 days)	15–30 min/day	3
Median: 3 days, Mean: 3.7 Days, SD \pm : 2.8.			

Table 3 The outcome of nine patients with risk factors after earthing implementation.

Age	Sex	Symptoms and signs (risk factors)	Earthing duration	Outcome
56	M	Dyspnea, (severe illness, blood Oxygen 38%, Lung CT-scan involvement >70%)	3 h/day	On 2nd day, dyspnea improved, blood Oxygen increased up to 95%
67	M	Fever, body pain, anorexia, loss of smell and taste sensations (Diabetes mellitus)	2 h/day	On 2nd day, fever settlement, recovery of smell and taste sensations, and appetite improvement
32	F	Fever (asthmatic on prednisolone maintenance 10 mg/day)	½ h/day	Immediate fever reduction after earthing, full recovery within five days
85	F	Fever, headache, (old age)	40 min/day	Recovery from all symptoms after six days
88	M	Fever and weakness (old age)	40 min/day	Recovery after four days
75	F	Fever, headache, runny nose, loss of smell and taste (diabetes, hypertension, old age)	1 h/day	Improve all symptoms after three days except intermittent mild fever
68	M	Five days of high fever, weakness, body pain (severe illness)	1 h/day	Fever subside after one session earthing
65	F	Fever, dyspnea, cough, required hospitalization (severe illness required continuous Oxygen supply)	40 min/day	Reduced oxygen supply into intermittent one after one session earthing
43	M	Dyspnea, cough, fever (severe illness required intermittent Oxygen supply and hospitalization)	½ h/day	Improved after three days that Oxygen supply was notrequired any more

Recovery time after starting earthing, Median: 3 days, Mean: 3 days. SD ±: 1.7.

Twenty-two patients with severe illness revealed full recovery within a mean duration of 3.2 days (SD ±: 2.6) after performing 15 min to 6 h daily earthing, Table 4. Twenty patients (83.3%) with severe illness started late earthing after five days or more of illness onset. However, two patients with severe illness had died because of delayed and insufficient earthing. The illness of both patients was confirmed by positive PCR results whereas one patient had positive chest CT-scan as well. They had risk factors of hypertension and diabetes mellitus. The first 68-year-old man had hyperglycemia (blood sugar 790 mg%), and uraemia (blood urea 250 mg%). Brief earthing was implemented twice for 15 min/day on every other day which was commenced on the 9th day of illness. He died in the hospital as a result of a cerebrovascular accident (CVA) that was demonstrated as an ischemic stroke on brain CT-scan. The second 58-year-old man who had previous coronary artery bypass grafting. He was given remdesivir in addition to other supportive medications. The earthing was commenced at the hospital on the 12th day of illness. He died because of multi-organ failure.

The most striking outcome was observed in a 56-year-old patient. He was admitted to the hospital because of dyspnea, cough, fever, and blood Oxygen level 74%. PCR for COVID-19 was positive. Chest CT scan showed more than 70% involvement of lungs. The patient was given continuous oxygen supply, antiviral Avifavir, i.v. fluid, Prednisolone, Azithromycin, i.v. Ceftriaxone, and convalescent plasma infusion. All these medications were given to the patient in the hospital for one week that no improvement was noticed. Furthermore, the patient condition was deteriorated more after administration of convalescent plasma. The patient requested discharge from the hospital upon his responsibility. At home, the patient had continued on prescribed medical treatment and continuous oxygen therapy. By

the end of the second week of acquiring the infection, he was extremely deteriorated. He was unable to speak any words because of severe dyspnea. The oxygen level on oximeter measurement while the patient on continuous oxygen administration was 38%. As the patient could not sit or leave his bed to perform earth contact, the patient's son was instructed to perform earthing to the patient by means of a wire and plate that connected him to ground. Substantial improvement was noticed on the second day after two sessions of earthing (3 h/day). Oxygen level increased to 95% while the patient on oxygen supply and 77% without oxygen administration. Full recovery was established after three days on 3 h daily earthing that he was just complaining from weakness and exhaustion for further one week. It was obvious that earthing enhanced healing because the patient was on extensive medications for two weeks and his condition getting worse. Afterward, a rapid improvement after few hours of earthing indicated a significant role of earthing in the healing process. Another 65-year-old woman who was severely dyspnoeic that admitted to the hospital for oxygen supply and discharged for continuous oxygen therapy at home. She was also improved after a 40 min earthing session after which she was required intermittent oxygen supply. Another 43-year-old man who was admitted twice in the hospital for oxygen therapy. He conducted earthing for 30 min daily at home after discharge from the hospital. He got full recovery after three days of earthing. All other patients with severe illness were improved on regular medications and sufficient earthing without any complications.

In 47 patients with mild and moderate illness, the median and mean duration of illness were both 7 days (SD ± 4). On the other hand, the mean duration of illness in 22 patients with severe illness was 11.2 days (SD ± 4.3), and the Median was 10.5 days, Table 4. For the total 69 cases who performed

Table 4 The outcome of twenty-four patients with severe illness after application of earthing.

Age	Sex	Symptoms and signs (duration/day before earthing)	Earthing duration	Outcome
67	M	Fever, loss of smell and taste sensation, weakness, (20 days)	2 h/day for 3 days	Improvement after 1 day of earthing
42	F	Headache, sore throat, weakness, severe myalgia, anorexia, (7 days)	3 h/day for 21 days	Dramatic relieve after 2 days of earthing
48	M	Fever, myalgia, pharyngitis, (14 days)	1 h/day for 1 day	Improvement after one earthing session
75	M	Fever, headache, myalgia, (10 days)	½ h/day for 1 day	Improvement after 1 day of earthing application
56	M	Severe dyspnea, fever, cough, blood Oxygen level 38% (14 days)	3 h/day for 3 days	Improved on 2nd day of earthing
55	F	Fever, dyspnea, weakness, (3 days)	3–4 h/day for 3 days	Full recovery after 3 days of earthing
40	F	Fever, dyspnea, severe chest pain, cough, weakness (1 day)	45 min/day for 12 days	Improvement within 11 days of earthing
35	M	Fever, severe headache, myalgia, joints pain, weakness (5 days)	40 min/day for 2 days	Immediate relief of fever and full recovery after 2 days
68	M	Fever, cough, blood sugar 790 mg%, blood urea 250 mg%, hypertension, CVA (on CT-Scan), (8 days)	15 min/day for 2 days	Patient died after 2 days of the last earthing in the hospital
65	F	Dyspnea, hospitalization for Oxygen and heparin therapy (7 days)	40 min/day for 3 days	Improvement after 3 days of earthing
43	M	Dyspnea, Fever, cough, hospitalization for Oxygen and heparin therapy, (2 days)	½ h/day for 3 days	Improvement after 3 days of earthing
59	F	Fever, dyspnea, cough, loss of smell and taste sensations (3 days)	20 min/day for 7 days	Fever settlement after 3 days whereas fullrecovery after 9 days of earthing
34	M	Fever, severe dyspnea, headache, weakness, myalgia, (15 days)	1 h/day for 15 days	Improvement after 2nd day of earthing and fullrecovery after 7 days of earthing
Age	Sex	Symptoms and signs (duration/day before earthing)	Earthing Duration	Outcome
42	F	Fever, cough, body pain, weakness, rigors, chills, (5 days)	3–6 h/day for 5 days	Improvement of all symptoms except cough after 1 day of earthing. Full recovery after 5 days
58	M	Fever, weakness, disorientation, confusion, (11 days). The patient has hypertension, diabetes mellitus, and previous coronary artery bypass grafting.	15 min/day for 3 days	The patient died after 3 days from multi-organ failure
35	F	Fever, dyspnea, cough, weakness, loss of smell sensation, (5 days) Pregnant for 6 months	20 min/day for 3 days	Full improvement after 3 days of earthing
63	F	Fever, dyspnea, myalgia, headache, (7 days)	½ h/day for 3 days	Improvement after 2 days of earthing
45	M	Dyspnea, body pain, loss of smell and taste sensations (6 days)	1 h/day for 2 days	Improvement after 1 day of earthing
49	F	Myalgia, headache, sore throat, weakness, (8 days)	20 min/day for 4 days	Improvement after 3 days of earthing
73	M	Fever, dyspnea, headache, (9 days)	½ h/day for 2 days	Improvement after 2 days of earthing
53	F	Dyspnea, chest pain, weakness, (10 days)	2 h/day for 4 days	Improvement after 3 days of earthing
41	F	Fever, cough, myalgia, headache, (6 days)	½ h/day for 3 days	Improvement after 3 days of earthing
63	M	Dyspnea, anorexia, loss of smell sensation, loss of weight, refused hospital admission, (10 days)	2 h/day for 2 days	Improvement after 2 days of earthing
66	M	Fever, dyspnea, cough, (8 days)	45 min/day for 3 days	Improvement after 2 days of earthing
Recovery time after start earthing, Median: 2.5 days, Mean: 3.2 days, SD ±: 2.6.				
Total illness duration, Median: 10.5 days, Mean: 11.2 days, SD ±: 4.3.				

Table 5 COVID-19 infection outcome among 18 household people with and without earthing.

Never contact with earth before and during illness		Regular contact with earth by barefoot walking	
Age	Sex	Age	Sex
34 M	Sever illness, fever, severe dyspnea, headache, weakness, myalgia, (15 days) F	30	F
50	Moderate illness, fever, headache, cough, (7 days)	67	M
70	Severe illness, dyspnea, body pain, inability to walk, increased blood sugar, chest involvement on CT-Scan 50%, (40 days)	67	F
Eight family members acquired the illness. Diabetic father (56 yr) died after 17 days of illness, fever, weakness, and anorexia. Wife, sons and daughters all were infected. Mother (52 yr) and son (30 yr), both contracted severe illness. Mother died. 59 M and 59 F both contracted severe illness, fever, cough, weakness, myalgia. (30 days, 28 days)		Couple	Never contracted the disease
		Couple	Never contracted the disease
		Couple	Mild fever and cough for 7 days
		Family members	
		Family members	
		Couple	

earthing, the mean duration of illness was 8.9 days (SD \pm 4.6), while the median was 9 days. They were improved within 2 h–11 days after starting earthing (mean: 2.9 days, SD \pm 2, median: 2 days).

Six families including 18 people were selected randomly to investigate the progress of illness among patients without earthing. Fifteen patients were never walking barefoot whereas three people were walking barefoot regularly at home, Table 5. In three couples, three people without earth contact acquired the illness, while the other two with regular earth contact had never contracted the illness. The third one with earth contact was contracted mild illness. The other three families, who were all never walked barefoot, all family members were contracted the illness from which two patients had died. The death rate among patients without earthing was 2 out from 15 (13.3%) while seven cases contracted severe illness (46.6%).

The following symptoms were improved after earthing conduction: fever, dyspnea, cough, sore throat, weakness, headache, chest pain, taste and smell sense loss, anorexia, and body pain.

Discussion

The outcome of most patients in the present study revealed significant improvement after one to three days of earthing sessions. The mean duration of illness appeared to be short (6.3 days) in patients who performed prophylactic earthing. In patients with early commencement earthing, revealed improvement within a mean duration of 3.7 days. The patients with risk factors were also improved within a mean duration of three days after starting earthing. Moreover, 22 patients with severe illness out of 24 were improved within a mean duration of 3.2 days following earthing as well. The median duration of illness in the present study was 9 days among 69 patients. This is lower than that reported by WHO, which revealed the median duration for COVID-19 symptoms to subside is 14 days. WHO also reported that the median illness duration is 21–42 days for patients with severe illness [24], whereas the median illness duration in the present study was 10.5 days for patients with severe illness. It was also noticed in certain families, that people without earth contact acquired the illness and even death more than those who were on regular earth contact. The death rate among people without earth contact (13.3%) is higher than global death rate which ranged from 0.001% in youngest age group to 8.29% in oldest age group [25]. Furthermore, 46.6% of patients without earthing contracted severe illness which is higher than usual reported rate of severe illness as around 5% of cases [26]. These outcomes might indicate a significant role of earthing in healing or preventing of COVID-19 infection.

It is well known that an overwhelming inflammatory response is the cause of human death from influenza infections [5]. Severe acute respiratory syndrome COVID-19-induced infection can be associated with coagulopathy, finding concordance with infection-induced inflammatory changes as noticed in patients with disseminated intravascular coagulopathy [27]. The best way to avoid the suppression of anti-viral immune response is to choose selective instead of broad

immunosuppressive drugs. Corticosteroids and other immunosuppressive therapies have anti-inflammatory effects although they hamper the immune system. On the other hand, anticoagulation by acetylsalicylic acid might enhance metabolic acidosis, which could deteriorate the patient's condition who has respiratory acidosis. Earthing has revealed anti-inflammatory effects [3] and improvements in the immune response [28], and both effects have been shown to be mandatory for influenza treatment [4]. In addition, earthing was shown to promote the immune response following vaccination by increasing gamma globulin level [28]. Connection with earth has also been shown to reduce red blood cells (RBCs) aggregation and blood coagulation by increasing the zeta potential of RBCs. The zeta potential is a parameter that indicates the number of electrons on RBC surface. A greater number of zeta potential is associated with a higher ability of the RBCs to repel each other. Subsequently, the higher surface RBC negative charge is, the blood has less tendency to coagulate. Grounding has been demonstrated to enhance the surface negative charge on RBCs and thus decreases blood viscosity and clumping [29,30]. Hypoxemia is another major cause of mortality in patients with COVID-19 infection. A Randomized controlled trial study revealed that earthing had caused decreased blood oxygenation during 40 min grounding, followed by a dramatic increase in blood oxygen level after ungrounding [31]. Therefore, earthing could improve blood oxygenation significantly in COVID-19 patients with hypoxemia, which was noticed in some patients in the present study. From a historical point of view, American Indians have had faith in the healing ability of the earth. They have a tradition to bury patients with all types of illnesses in the earth up to their necks for some hours. A mud bath is valuable in producing rheumatic pain or joints pain relief caused by injuries, while mud packs have beneficial effects in fever reduction, treatment of influenza, measles, and scarlet fever [32]. People in rural areas with predominantly earth or green plants contact may acquire protection from COVID-19 infection that might be explained by the lower number of cases in rural than cities areas. Furthermore, the high incidence rate of COVID-19 in certain cities in the developed world might be related to character of the houses' floors which are made from non-conductive materials such as woods or plastic. Most people in the cities are used to wear insulated shoes without earth contact. The detachment from the earth might lead to accumulation of positive body charges or free radicals that could interfere with the normal immune response. Such possible effects on the cells of the immune system required investigation by further studies. Grounding might convert the unregulated cascade of host immune response to infection into a regulated one that prevents immune insufficiency or cytokine storm and death.

It is a wealth to mention a news report from India during the extreme number of cases of Delta variant. The report revealed that high social class people were most commonly contracted the illness who were living in multilevel buildings. On the other hand, there were no reported cases of COVID-19 within the poor people who were living in the vicinity who had one-level houses on the ground. These people might have direct contact with earth more than people who are living in multilevel buildings. Thus, continuous earth

contact may prevent infection or produce mild illness. Furthermore, the infection rate is higher in rich developed countries with high levels of vaccination than developing poor countries with lower levels of vaccination. This might be explained by a higher contact with earth among people in poor countries than that among rich countries people. Moreover, the patients who acquired the infection are usually got bedridden whether they are at home or at hospital. This leads to avoidance of earth contact which might aggravate their condition.

Therefore, the anti-inflammatory, anticoagulation, immunity enhancement, blood oxygenation promotion, and fever reducing effects of earthing could have a vital role in COVID-19 infection cure and prevention. The healing effects of earthing on COVID-19 infection deserve extensive investigations. It might have a major impact globally. It is cost-free treatment that could save thousands of lives. It could conserve a significant budget that spent for medications, vaccines, and other more healthcare resources as well.

The limitations of the present study were small a sample size, many patients were on usual treatments, the follow-up of patients was partially depending on the subjective feeling, and there was inadequate number of control people without earthing for outcome comparison. Further studies are required that involve large sample size, hospitalized patients, more patients with severe illness, and large number control group. Although few people without earthing were compared to others with earthing in the present study, the global illness duration was higher than that revealed for patients with earthing in the present study.

Conclusion

Earthing or grounding revealed a significant impact in the management of patients with COVID-19. It is a contact with earth by several means that could cause an influx of electrons into the body with subsequent anti-inflammatory effect, immunity enhancement, anticoagulation, rising blood oxygenation, and antipyretic effect. The main complications of COVID-19 illness are hypoxemia, coagulopathy, inflammation, and immune defect, which endanger the patient's life. All these complications could be relieved by earthing without the deleterious side effects of the drugs and without cost as well. It is advised to perform sufficient and regular earthing for at least 40 min daily for prevention or treatment of COVID-19 infection. Earthing could be applied at any stage of the illness although earlier is better. The current study revealed that severe illnesses in most cases were related to delay earthing rather than the age of the patients. It is more effective when conducted on wet muddy earth. It might be effective for other respiratory viral infections such as influenza. Even under the circumstances of vaccine availability, it could be employed following viral mutation. Earthing might also be implemented during future new pandemic emergence that the manufactured vaccines cannot work anymore. In addition, vaccines demand prolonged time for development and continuous revision in case of frequent viral mutations, while resistance to antiviral medications might be developed at any stage of the pandemic.

It is recommended to apply earthing as an adjuvant therapy to the current medical treatment protocols and preventive measure for COVID-19 infection though not replacing the approved medications or prospective vaccines in the management or prevention of the illness.

After searching the electronic databases, no previous study on patients was found that investigates the role of earthing in prevention and treatment of COVID-19 infection.

Ethics approval

Approved by the Ethics Committee of the College of Medicine, University of Basrah, Iraq, under the Institutional Review Board at session number 15, 2020.

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Consent to participate

Consent to participate was obtained from each patient or his or her guardian.

Conflicts of interest

The author has no potential conflicts of interest to disclose.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.bj.2022.08.002>.

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