

Three cases of virgin coconut oil-induced lipoid pneumonia in infants

Maria Isabel M Atienza, Gerarda Ember R Afable,
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ABSTRACT

Introduction: Three cases of lipoid pneumonia in infancy are presented to highlight the risk factors, clinical features, diagnostic and therapeutic measures of this rare and serious type of pneumonia. **Case Series:** The three infants were admitted at a tertiary hospital for pneumonia after having received treatment with supplemental virgin coconut oil (VCO) treatment for poor weight gain. All cases presented with tachypnea and clear breath sounds, while only case #3 presented with fever. All three admissions resulted in a battery of diagnostic tests. Computed tomography (CT) scans of the chest demonstrated the typical features of lipoid pneumonia showing air-space consolidation with areas of low attenuation having negative Hounsfield unit (HU). Fiberoptic bronchoscopy with bronchoalveolar lavage allowed the documentation of the presence of residual oil in the affected lungs. All three were generally unresponsive to empiric intravenous antibiotics. **Conclusion:** The potential benefits of oral coconut oil are minimal and the risk of oil aspiration results in a complicated form of pneumonia. The oral administration of coconut oil should be avoided in infants who have had low birth weight and poor weight gain even on pure breastfeeding. An immediate chest CT scan and bronchoscopy with bronchoalveolar lavage

must be done in all cases with a high index of suspicion of coconut oil-induced lipoid pneumonia. The three cases have demonstrated that lipoid pneumonia in infants is complicated by the presence of atypical infectious agents, transient immunodeficiency, and prolonged hospitalization. Furthermore, there is the great need for continuous home treatment with antibiotics and supplemental oxygen inhalation.

Keywords: Bronchoalveolar lavage, Coconut oil, Foamy macrophages, Lipoid pneumonia

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INTRODUCTION

This case series aims to establish coconut oil supplement as an important risk factor for exogenous lipoid pneumonia in infants. Three cases of lipoid pneumonia in infancy are presented to highlight its clinical features with special interest on key diagnostic signs and therapeutic modalities that are essential to a successful management of this condition. This case series reviewed reports of coconut oil-induced lipoid pneumonia as a risk factor for atypical mycobacterial infection, chronic refractory pneumonia, and immunological deficiency in infancy. Three cases were confined at a tertiary hospital in the Philippines with a history of coconut oil treatment for poor weight gain in infancy.

CASE SERIES

Case 1

The first case is a 3-month-old female infant admitted with a respiratory rate of 70/min with clear breath sounds and with a chest X-ray finding of pneumonia with consolidation of the both lungs (Figure 1). The infant had a history of treatment with virgin coconut oil supplementation at three weeks of age for poor weight gain despite breast feeding. The patient's condition did not improve with the initial management consisting of intravenous cefuroxime, oral erythromycin, intravenous hydration, and oxygen support. Further diagnostic workup included purified protein derivative (PPD) testing, gastric aspirate acid-fast bacilli (AFB) smear and culture, a repeat chest X-ray study (Figure 2), and a chest CT scan. Serial chest X-rays showed progression of pneumonia with consolidation and concomitant adenopathy. The chest high-resolution computed tomography (HRCT) scan showed necrotizing pneumonia with cavitory lesions and with lymph node involvement reflective of progressive tuberculosis. Interspersed areas of low attenuation with negative Hounsfield unit (HU) were also noted (Figure 3).

Anti-tuberculosis (anti-TB) medications with prednisone were initiated as a gastric aspirate smear was positive for acid-fast bacilli. The primary impression at this time was primary progressive TB with extrapulmonary TB involvement (mediastinal and hilar adenopathy and endobronchitis). Primary immunodeficiency panel showed significantly decreased CD3, CD4, and CD8, while the rest of the panels were within normal limits. Tests for human immunodeficiency virus (HIV), cystic fibrosis, and primary ciliary dyskinesia were also negative.

Fiberoptic bronchoscopy with bronchial lavage was done on the 37th hospital day. The aspirated bronchial washing revealed a milky white aspirate with oil droplets visible on the specimen vial on standing (Figure 4). On the 41st hospital day, the gastric aspirate culture was positive for non-tuberculous mycobacterium. On the 46th hospital day, the gastric aspirate culture grew *Mycobacterium abscessus*, which was sensitive to amikacin, cefoxitin, and clarithromycin. The patient responded well to antibiotic

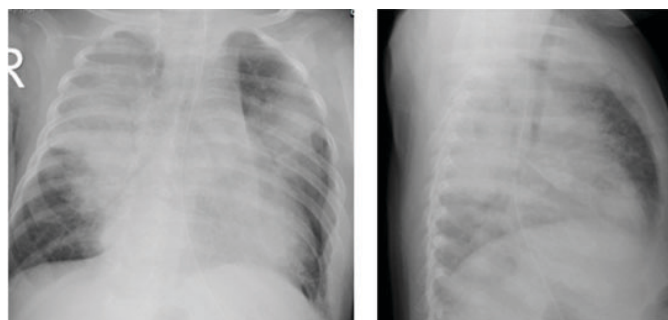


Figure 2: Chest X-rays on the 5th day showed progression of pneumonia with consolidation and concomitant adenopathy.

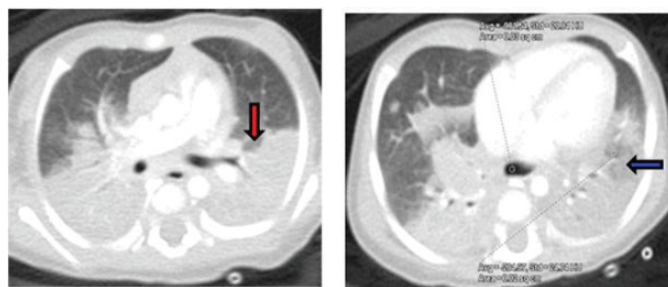


Figure 3: CT scan showing necrotizing pneumonia with cavitory lesions suggestive of progressive tuberculosis with lymph node and lung involvement. The CT scan also showed bilateral lower lobe consolidation with areas of low attenuation (red arrow) having an average Hounsfield unit of -205 relative to air, and $HU = -982$ (blue arrow).

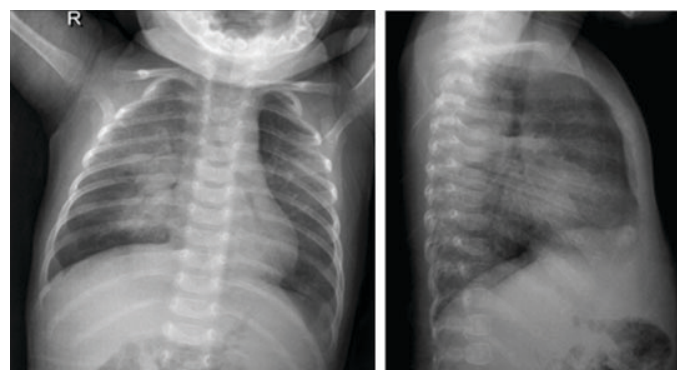


Figure 1: Chest X-ray on admission showing hyperaeration with bilateral pneumonia mostly on the right side.



Figure 4: The specimen bottle from the bronchoscopy with aspiration in Case #1 showed a milky white aspirate with yellowish oil droplets consistent with the impression of oil aspiration pneumonia.

treatment and was discharged on the 58th hospital day. Repeat primary immunodeficiency panel after six weeks showed improvement in the actual T cell counts. Home medications included quadruple anti-TB drugs, and intravenous amikacin, clarithromycin, and cefoxitin. Oxygen supplementation was also maintained during sleeping hours due to persistent tachypnea. A repeat chest CT scan after eight months showed significant regression of the opacities in both lung fields (Figure 5).



Figure 5: Repeat chest CT scan of Case #1 done eight months after discharge showing significant clearing on both lung fields.

Case 2

The second case is a 3-month-old female admitted for vomiting and diarrhea, which started five days before admission. The patient had been given daily coconut oil via dropper one month before admission for poor weight gain despite breastfeeding. On physical examination, the respiratory rate was 54/min with clear breath sounds. Chest X-ray revealed diffuse haziness with air bronchogram on both lung fields (Figure 6).

The patient was managed with intravenous hydration, supportive oxygen inhalation, and intravenous gentamicin and ceftriaxone. The vomiting and diarrhea resolved after two days but the patient remained tachypneic. By the 10th hospital day, the patient developed fever with thrombocytosis and elevated C-reactive protein. A repeat chest X-ray on the 12th hospital day revealed persistent hyperaeration and bilateral opacities. Antibiotics were shifted to intravenous cefotaxime, gentamicin, and azithromycin.

A chest HRCT scan on the 20th hospital day revealed the presence of air-space consolidation and ground glass densities in both upper and lower lung fields. There were areas of low attenuation having negative HU (Figure 7). The immunodeficiency panels done on the 31st hospital day showed low immunoglobulin G (IgG) and immunoglobulin A (IgA) levels consistent with transient hypogammaglobulinemia. The patient was placed on

reverse isolation precautions and was given intravenous immunoglobulin (IVIg) infusion.

Fiberoptic flexible endoscopy with bronchoalveolar lavage was performed on the 34th hospital day. Findings showed a floppy larynx (mild laryngomalacia), and endobronchitis with hypersecretion. Abundant milky white secretions were suctioned and collected (Figure 8). Post-bronchoscopy, the patient developed occasional

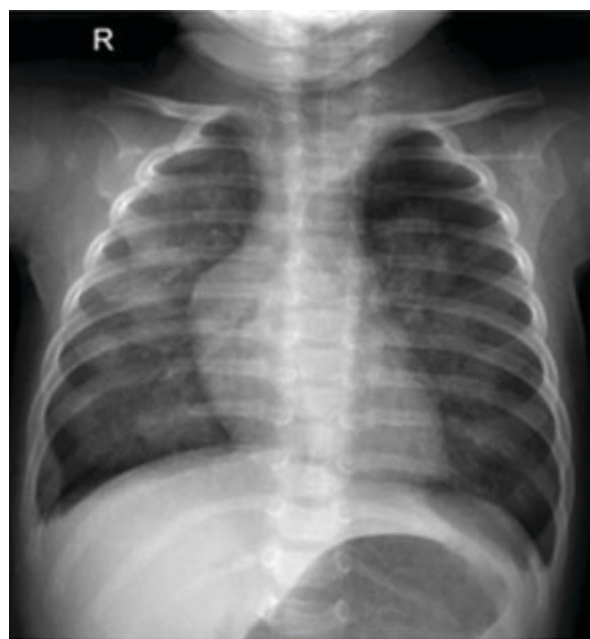


Figure 6: Chest X-ray showed diffuse haziness with air bronchogram on both lung fields.

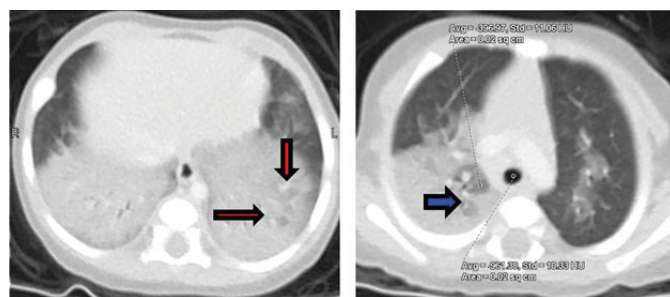


Figure 7: Chest CT scan showed bilateral lower lobe consolidation with patches of low attenuation (red arrows). Hounsfield (HU) of these areas averaged -397 with comparison to air, $HU = -961$ (blue arrow).



Figure 8: Bronchoalveolar lavage aspirate showed abundant creamy fluid obtained with tracheal suctioning.

nonproductive cough, low-grade fever, and decreased milk intake. Antibiotics were shifted to ampicillin-sulbactam as the patient subsequently improved. She was finally discharged on the 42nd hospital day with oral ciprofloxacin and isoniazid as home medications.

Case 3

The third case is a 6-month-old female admitted for recurring episodes of cough and fever when she was 4 months old. Coughing episodes were associated with virgin coconut oil feedings, which was started at age 3 months. The patient was observed to have poor weight gain from age 3 months despite adequate breastfeeding. On admission, the infant had a respiratory rate of 62/min and physical examination revealed subcostal retractions but with clear breath sounds. The chest X-ray (Figure 9) and the chest CT scan showed pneumonia with bilateral consolidation with areas of low attenuation having negative HU (Figure 10).

The patient was given intravenous cefuroxime and the fever was managed with paracetamol. The patient was afebrile on the 6th day but she remained tachypneic. Gastric aspirate AFB smear was negative. She was found to have low serum IgG and IgA, consistent with transient hypogammaglobulinemia of infancy.

Bronchoscopy with bronchial lavage was performed on the 10th hospital day. The lavage showed the presence of oil droplets which were also demonstrable on the aspirate cell block (Figure 11). Bronchial aspirate showed a gross appearance of cream tan to white, turbid fluid which layered on standing. On microscopic examination, the smears showed many reactive foamy macrophages admixed with lymphocytes, few neutrophils, and bacterial clusters scattered over a mucoid background (Figure 12). The patient was shifted to oral ciprofloxacin and was discharged on the 23rd hospital day with occasional coughing episodes and mild tachypnea. Oxygen inhalation was given during sleeping hours.

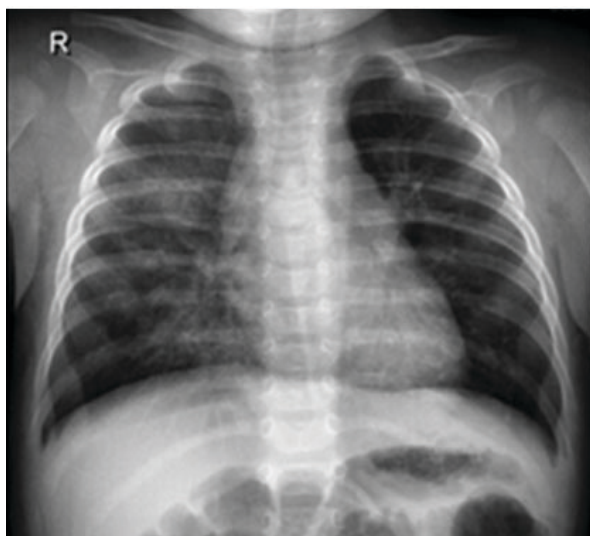


Figure 9: Chest X-ray showing bilateral pneumonia.

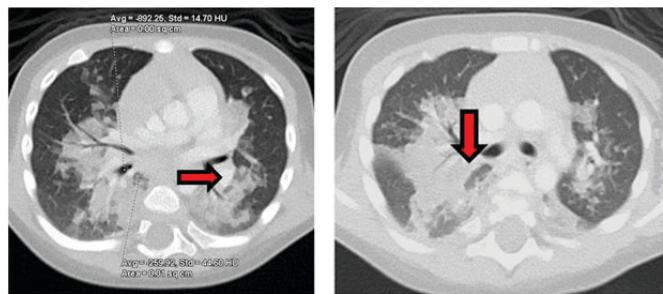


Figure 10: Chest CT scan showed bilateral lung consolidation with interspersed areas of low attenuation are shown (red arrows), with an average Hounsfield unit of -260 relative to air, $HU = -892$.

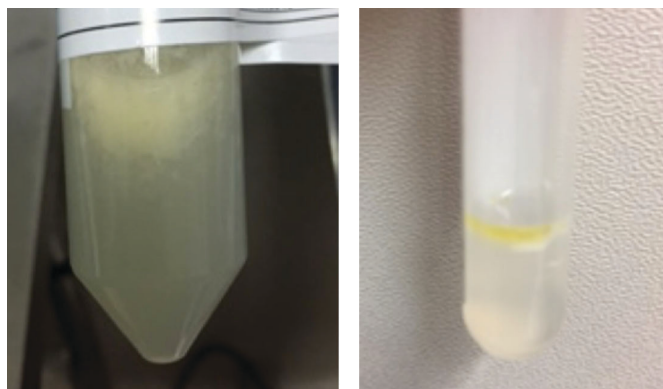


Figure 11: Bronchoalveolar lavage fluid showed the presence of oil droplets, which were also demonstrable on the aspirate cellblock.

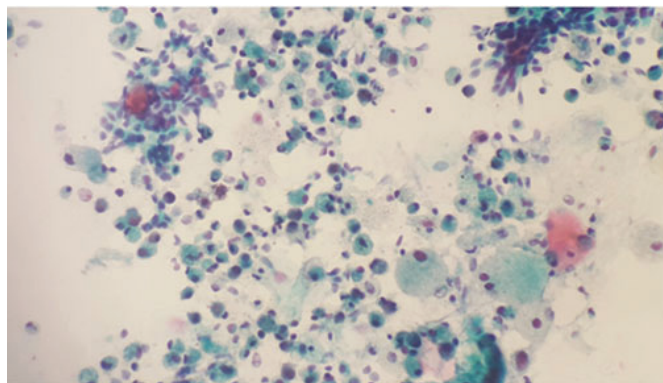


Figure 12: Bronchoalveolar lavage smears showed reactive foamy macrophages containing oil with lymphocytes, few neutrophils, and bacterial clusters scattered over a mucoid background.

DISCUSSION

Clinical characteristics of coconut oil-induced lipid pneumonia

A comparative table (Tables 1 and 2) of the clinical characteristics of the 3 cases shows the following common features that are highly suggestive of a diagnosis of coconut oil-induced lipid pneumonia.

Table 1: Clinical information from the three cases of coconut oil-induced lipid pneumonia

	Case #1	Case #2	Case #3
Age/Gender	3 months/Female	3 months/Female	6 months/Female
Birth weight	2950 grams	2650 grams	2810 grams
Weight on admission	3650 grams Below 3rd percentile weight for age*	4400 grams Below 3rd percentile weight for age*	5700 grams Below 3rd percentile weight for age*
Milk feeding	Purely breastfed from birth up to 3 months	Purely breastfed from birth up to 3 months	Purely breastfed from birth up to 6 months
Age when VCO was started	3 weeks old	2 months old	3 months old
Dosage of VCO	1 mL drops given 5–7 times a day	1 mL drops given 5–7 times a day	0.5–1 mL drops given 7–10 times a day
Vital signs on admission	HR 124, RR 70, Temp 36.2°C, O ₂ Sat 95%	HR 140, RR 54, Temp 36.8°C, O ₂ Sat 85%	HR 124, RR 62, Temp 39°C, O ₂ Sat 98%
Presenting signs and symptoms	Tachypnea No cough No fever	Tachypnea No cough No fever Vomiting and diarrhea	Choking episodes after VCO feeding Tachypnea Cough and colds Fever
Chest physical examination	Clear breath sounds (+) chest retractions	Clear breath sounds No retractions	Clear breath sounds (+) chest retractions
Chest radiograph	Bilateral pneumonia with consolidation and concomitant adenopathy	Bilateral pneumonia with diffuse haziness with air bronchogram on both lung fields	Bilateral pneumonia with consolidation
Chest CT scan	Bilateral lower lobe pneumonia with areas of consolidation. Hounsfield unit (HU) average of –205 relative to air, HU = –982. Necrotizing pneumonia with cavitary lesions	Bilateral lower lobe consolidation with patches of low attenuation. HU of these areas averaged –397 relative to air. HU = –961	Bilateral lung consolidation with interspersed areas of low attenuation. HU average of these areas of –260 relative to air. HU = –892

*Source: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Disease Prevention and Health Promotion (2000). <http://www.cdc.gov/growthcharts>.

Table 2: Additional clinical information from the three cases of coconut oil-induced lipid pneumonia

	Case No. 1	Case No. 2	Case No. 3
Fiberoptic bronchoscopy with bronchoalveolar lavage	37th hospital day. Presence of oil noted	34th hospital day. Abundant creamy fluid obtained Other findings included mild laryngomalacia, endobronchitis with chronic hypersecretion	10th hospital day. Creamy turbid fluid which layered on standing was observed. Foamy macrophages seen on microscopic examination.
Bronchial fluid test results	AFB smear negative, GenXpert (–) Positive (+) growth of <i>Enterobacter cloacae</i>	Positive (+) growth of <i>Pseudomonas aeruginosa</i>	Positive (+) growth of <i>Serratia marcescens</i> . AFB smear/culture (–)
Gastric aspirate AFB smear/culture	Gastric aspirate was positive (+) for AFB. AFB culture grew <i>Mycobacterium abscessus</i> —sensitive to amikacin, ceftioxin, and clarithromycin	Gastric aspirate AFB smear/culture (–) GenXpert (–)	Gastric aspirate AFB smear/culture (–)

Table 2: (Continued)

	Case No. 1	Case No. 2	Case No. 3
Immunodeficiency panel results	CD3, CD4, and CD8 lymphopenia probably due to acquired immunodeficiency	Low serum IgG and IgA levels consistent with transient hypogammaglobulinemia	Low serum IgG and IgA levels consistent with transient hypogammaglobulinemia
Duration of hospitalization	58 days	42 days	14 days

1. Low birth weight infants purely breastfed during the first 3–6 months.
2. Coconut oil supplementation given by dropper between feedings.
3. A history of choking or coughing associated with the coconut oil drops.
4. Tachypnea with clear breath sounds on presentation.
5. Chest HRCT shows areas of consolidation with interspersed areas of low attenuation having negative Hounsfield unit (HU).
6. A poor response to antibiotic treatment and prolonged hospitalization.
7. Pulmonary infection with mycobacteria or gram-negative bacteria.
8. Recovery after fiberoptic bronchoscopy and bronchoalveolar lavage.
9. Demonstration of the oily substance in the bronchoalveolar lavage fluid.
10. Transient immunodeficiency.

The oral administration of coconut oil on a purely breastfed infant who subsequently chokes would be highly suggestive of oil aspiration. The findings of rapid breathing with chest retractions and with clear breath sounds combined with typical chest CT findings would be an indication for bronchoscopy. Subsequent bronchoalveolar lavage to remove the offending oil as soon as possible would hasten recovery and resolution on infection.

Evidence on coconut oil as a nutritional supplementation

There is no clinical evidence supporting the use of coconut oil as a supplement for poor weight gain in infants. A study done on very low birth weight babies using coconut oil demonstrated poorer weight gain and possible harmful effect with coconut or safflower oil [1]. A more recent randomized controlled trial with oral coconut oil showed no significant effect on weight gain and no effect on head circumference and length [2].

Importance of chest CT scan and bronchoscopy

The diagnosis of exogenous lipid pneumonia can be confirmed by the demonstration of foamy macrophages

from the bronchoalveolar lavage fluid [3]. The chest CT findings of these three cases showed that a key pattern of this condition is consolidation with foci of decreased attenuation having negative HU which are highly suggestive of intrapulmonary fat consistent with lipid pneumonia [4].

Fiberoptic bronchoscopy with bronchoalveolar lavage hastened the diagnostic confirmation and improvement of the pneumonia. Prolonged hospitalizations were followed subsequently by the need for home treatment with antibiotics and oxygen inhalation until a complete resolution is achieved.

Evidence on the association of lipid pneumonia with mycobacterial infections

An association of lipid pneumonia and atypical mycobacterial pneumonia has been suggested in previous case studies. One study reported nine cases of oil-induced pneumonia with a superinfection with acid-fast bacilli that was confirmed by autopsy in four cases, lobectomy in four cases, and lung biopsy in one case [5]. The distinctive histologic feature seen was noncaseating granulomas surrounding lipid vacuoles containing acid-fast bacilli. Hassan postulated that mycobacterium with its complex cell wall appears to derive sustenance from the lipid particles seen in lipid pneumonia [4]. There may be a need for analytical case-control studies in order to show an association between lipid pneumonia and mycobacterial infections.

Immunodeficiency and lipid pneumonia

The transient immunodeficiency in these three cases was manifested by testing as hypogammaglobulinemia in Case Nos. 2 and 3, and in lymphopenia (CD3, CD4, and CD8) in Case No. 1. These abnormalities may have predisposed the patients to infection for which aggressive antibiotic treatment and IVIg infusion was deemed necessary.

The three cases highlight the need to identify possible immune deficiencies in cases of lipid pneumonia and to initiate prompt treatment [6].

CONCLUSION

This report highlights the potential hazards of giving coconut oil feedings to infants with poor weight gain. The administration of oil by dropper is a major predisposing factor for lipoid pneumonia. The potential beneficial effects of this supplement must be carefully weighed against the harmful effects of oil aspiration. An immediate chest CT scan and bronchoscopy with bronchoalveolar lavage must be done in all cases with a high index of suspicion of coconut oil-induced lipoid pneumonia.

REFERENCES

1. Vaidya UV, Hegde VM, Bhave SA, Pandit AN. Vegetable oil fortified feeds in the nutrition of very low birthweight babies. *Indian Pediatr* 1992;29(12):1519–27.
2. Arun S, Kumar M, Paul T, et al. An open-label randomized controlled trials to compare weight gain of very low birth weight babies with or without addition of coconut oil to breast milk. *J Trop Pediatr* 2019;65(1):63–70.
3. Buda P, Wieteska-Klimczak A, Własienko A, et al. Lipoid pneumonia – a case of refractory pneumonia in a child treated with ketogenic diet. *Pneumonol Alergol Pol* 2013;81(5):448–52.
4. Pilaian RK, Mathew JL, Sodhi KS, Rajwanshi A, Singh M. Revisiting a case of persistent pneumonia: Complication of hair oil aspiration. *J Paediatr Child Health* 2018;54(11):1284–5.
5. Ridaura-Sanz C, López-Corella E, Salazar-Flores M. Exogenous lipoid pneumonia superinfected with acid-fast bacilli in infants: A report of nine cases. *Fetal Pediatr Pathol* 2006;25(2):107–17.
6. Justiz Vaillant AA, Wilson AM. Transient Hypogammaglobulinemia of Infancy. In: *StatPearls*. Treasure Island (FL): StatPearls Publishing; 2020.

Author Contributions

Maria Isabel M Atienza – Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpretation of data, Drafting the work, Revising the work critically for important intellectual content, Final

approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Gerarda Ember R Afable – Acquisition of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Nathan David P Concepcion – Acquisition of data, Analysis of data, Interpretation of data, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Guarantor of Submission

The corresponding author is the guarantor of submission.

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Written informed consent was obtained from the patient for publication of this article.

Conflict of Interest

Authors declare no conflict of interest.

Data Availability

All relevant data are within the paper and its Supporting Information files.

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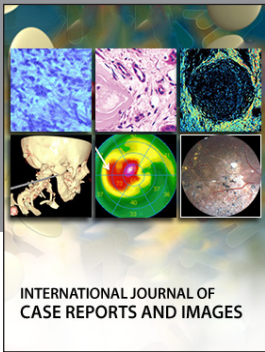
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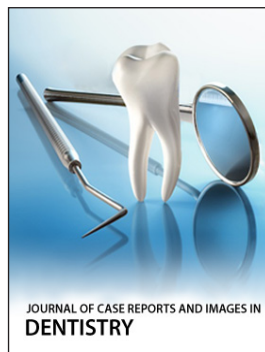
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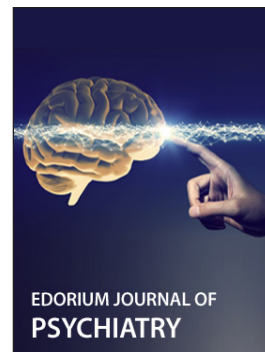
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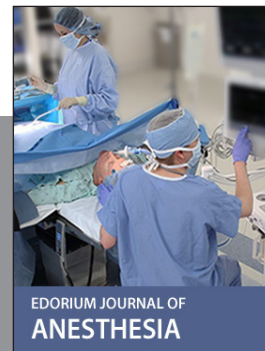
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