International Adoption of Children with Special Needs in Spain

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Abstract

International adoption has declined in recent years, although international adoption of children with special needs arises. We aim to describe our experience in international adoption of children with special needs and to analyze the concordance between the pathologies included in pre-adoption reports and the diagnosis made upon arrival.

We conducted a retrospective descriptive study including internationally adopted children with special needs evaluated at the reference unit of La Paz University Hospital (Madrid) between 2016-2019. Epidemiological and clinical variables were collected from medical records, and pre-adoption reports were compared to established diagnoses following their evaluation and complementary tests.

Fifty-seven children were included: 36.8% females, median of age: 27 months [IQR: 17-39], mostly coming from China (63.2%) and Vietnam (31.6%). The main pathologies described in the pre-adoption reports were hematological (22.6%) and neurological (24.6%). The initial diagnosis that motivated the international adoption via special needs was confirmed in 79.0% of the children. After evaluation, 17.5% were diagnosed with weight and growth delay and 27.4% with microcephaly, not previously reported. Infectious diseases were also prevalent (29.8%). Only 7% provided a complete immunization schedule.

Conclusion: According to this series, the pre-adoption reports appear accurate, with a very low rate of new diagnosis. Pre-existing conditions were confirmed in over 75% of cases. Complete evaluation upon arrival, including infectious diseases screening and close follow-up, ideally by experienced multidisciplinary teams in specialized units, is recommended to provide comprehensive care.

Introduction

International adoptions (IA) have declined sharply in recent years. The requirements to complete this complex procedure have been tightened: many countries have limited the profile of adopters and, concurrently, reception countries, including Spain, have limited adoptions from countries that did not guarantee an entirely safe process. In 2015, 801 IAs were performed in Spain compared to 370 in 2019. Of the latter, 65.4% were from Asia, 19.5% from European countries, 14% from Latin America, and 1.1% from Africa.

The proportion of children adopted presenting with pre-existing conditions has increased in Spain and other countries[1]. The definition of "special needs" (SN) arises from the urgency of speeding up the adoption of minors with chronic pathologies requiring evaluation and treatment in a short period of time. In China, children presenting with SN can be internationally adopted via a fast track called "green passage." In Vietnam, those children are adopted via "list 2".

IA represents an excellent opportunity for children presenting with medical conditions born in resource-limited settings. Still, the success of the process requires a well-informed adoptive family and an experienced and supportive professional team. During the pre-adoption process, referral units offer the possibility of discussing the clinical implications of each situation to facilitate to the foster parents the understanding of the child's condition, healthcare requirements, follow-up, treatment needs, and quality of life in the short and long-term. With the appropriate care, most children achieve a high quality of life. Surprisingly, data are scarce regarding the unique population of internationally adopted children with SN.

This study aims to describe the epidemiological and clinical characteristics of a cohort of internationally adopted children with SN. We aim to analyze the discrepancies, if any, between the pre-adoption reports provided during the adoption process and the clinical findings after a thorough evaluation in a referral unit over a three-year period.

Patients And Methods

Study design

A retrospective descriptive study was performed at a referral unit, Children's Hospital La Paz, Madrid, including all internationally adopted children with SN (called "green passage" if they came from China," list 2" from Vietnam), evaluated between January 2016 and July 2019.

The medical records were reviewed, and variables were collected starting at the pre-adoption visit and up to the sixth-month post-adoption. All children were managed according to a unified protocol (Fig. 1). Epidemiological variables and situation before adoption (family versus institution) were collected through medical records and interviews with foster parents. All medical background was reviewed (anthropometry, actual and previous pathologies, immunization schedule in the country of origin, and laboratory test and/or serologies).

The pathology specified in the reports supplied by the country of origin was collected in the first consultation upon arrival in Spain. In addition, anthropometry and results of the complementary tests performed were analysed, including serologies (human immunodeficiency virus [HIV], hepatitis B and C [HBV, HCV], syphilis and cytomegalovirus [CMV]) and microbiological study for endemic parasites (*Schistosoma* spp, *Strongyloides stercoralis*, *Toxocara canis* and/or malaria according to local epidemiology). The results of the coproparasitological study, TB screening [tuberculin skin test (TST) and interferon gamma release assay (IGRA)] and metabolic screening (using the Guthrie card) were included.

The Ethics Committee of the hospital (PI/4240) approved the study. No informed consent was required due to the retrospective design. All data were collected on an anonymized data set. The data were used in compliance with the laws in Spain regarding data protection: Organic Law (LOPD) 3/2018

of December 5, Protection of Personal Data.

Definitions

Low height or weight for age and sex were considered when they were below 2 standard deviations (SD). Delay in pondero-statural growth (DPSG) was defined as a height and weight for age and sex below 2 SD. Microcephaly was defined as head circumference (HC) for age and sex below 2 SD.

Anemia was defined as haemoglobin value < 10.5 grams /decilitre (g/ dL) in patients aged 6 months to 2 years, and < 11.5 g/ dL between 2 and 6 years of age.

Tuberculosis (TB) screening: TST was considered reactive above 10 millimetres of induration measured after 72 hours in children not previously vaccinated with BCG [Bacillus Calmette-Guérin], or in children over 3 years old, regardless of vaccination. In children under 3 years previously vaccinated with BCG and a TST > 10 millimetres, IGRA test was performed.

Statistical analysis

We used descriptive statistics to summarize demographic and clinical characteristics. We reported qualitative data with absolute frequencies and percentages and quantitative data with medians with lower and upper quartiles (IQR). We compared the results of pre and post-adoption reports using the chi-square or Fisher's test for categorical variables and the Kruskal-Wallis test for continuous variables. The level of significance for all analyses was set at 0.05. Statistical analysis was performed with SPSS version 18.

Results

A total of 57 children (21 female, 36.8%) were included, with a median age upon arrival in Spain of 27 months [IQR: 17–39]. 48.2% of adopting families corresponded to single-parent families. Among the adoptees, the Asian origin was predominant: 36 children (63.2%) from China, 18 (31.6%) from Vietnam, 1 (1.8%) from India, 1 (1.8%) from Ethiopia, and 1 (1.8%) from Bulgaria. In their country of origin, 73.7% lived in orphanages and 5.3% with a foster family. One child (1.8%) had been hospitalized since birth. In 90% of the minors, the family history was unknown.

The pathologies reported in the pre- and post-adoption visits are compared in Table 1. The pathology that motivated the IA via SN was confirmed in 45 children (79%). Of the remaining 12, 8 were completely healthy children, and 4 had other minor pathologies.

Table 1

Pre and post-adoption pathology

	Pre-adoption results, N (%)	Post-adoption results, N (%)	
General Pathology	57/57 (100)	57/57 (100)	*p*
Palatal malformation	12 (21.0)	12 (21.0)	1
Cardiopathy	9 (15.8)	12 (21.0)	0.468
Operated congenital cardiopathies	6 (10.5)	6 (10.5)	
Interatrial communication	1 (1.8)	0	
Patent foramen ovale	2 (3.5)	3 (4.8)	
Other	0	4 (7.0)	
Digestive pathology	9 (15.8)	6 (10.5)	0.405
Operated digestive tract malformations	5 (8.8)	5 (8.8)	
Abdominal wall malformations	2 (3.5)	0	
Digestive problems	3 (5.3)	1 (1.8)	
Neurological pathology	14 (24.6)	22 (38.6)	0.106
Neurodevelopmental delay	4 (7.0)	6 (10.5)	
Alterations in craniofacial morphology	7 (12.3)	8 (14.0)	
Macrocephaly	1 (1.8)	1 (1.8)	
Microcephaly	0	17 (29.8)	
Sensorineural deafness	2 (3.5)	2 (3.5)	
Intracranial hypertension	1 (1.8)	1 (1.8)	
Infectious pathology	7 (12.3)	17 (29.8)	**0.021**
Intestinal parasitosis	0	8 (14.0)	
Systemic parasitosis*	0	11 (19.3)	
Congenital infections	6 (10.5)	1 (1.8)	
Other	1 (1.8)	1 (1.8)	
Dermatological pathology	6 (10.5)	8 (14.0)	0.568
Angioma	2 (3.5)	2 (3.5)	
Atopic dermatitis	3 (5.3)	3 (5.3)	
Scabies	1 (1.8)	1 (1.8)	
Vitiligo	0	1 (1.8)	
Allopecic plaque in scalp	0	1 (1.8)	
Supected endocrinopathy	-	5 (8.9)	-
Respiratory pathology	5 (8.8)	1 (1.8)	0.093
Orthopedic pathology	3 (5.3)	3 (5.3)	1
Visual anomalies	4 (7.0)	8 (14.0)	0.222
Visual acuity alteration	3 (5.3)	7 (12.3)	
Retinopathy of prematurity	1 (1.8)	1 (1.8)	
Hematological pathology	14 (22.6)	4 (7.0)	**0.012**
Anemia not otherwise specified	9 (15.8)	2 (3.5)	
Talasemia	4 (7.0)	2 (3.5)	
Jaundice	1 (1.8)	0	
Delay in pondero-statural growth	1 (1.8)	10 (17.5)	**<0.05**
Serologies (congenital infections)	56 (98.3)	57 (100)	

Anti-HIV antibodies (tested)	53 (93.0)	57 (100)
Positive results	0	0
Syphilis (RPR and/or VDRL tested)	51 (91.1)	57 (100)
Positive results	2 (3.9)	0
HBs antigen (tested)	55 (96.5)	57 (100)
Positive results	1 (1.8)	0
Anti-VHC antibodies (tested)	3 (5.3)	57 (100)
Positive results	1 (33.3)	1 (1.8)

All patients with a previous diagnosis of palatal malformation, congenital heart disease, or intervened digestive malformation were confirmed (Table 1). Two patients reported a prior diagnosis of inguinal and umbilical hernia, neither of which were observed in the post-adoption consultation.

Concerning patients with pre-adoption reported neurological pathologies, those were confirmed, and new diagnoses were added, in addition to 17 cases of microcephaly not previously described.

According to the pre-adoptive report, out of six children with presumed congenital infection (three congenital syphilis, one hepatitis B, one hepatitis C, and one CMV infection), only one adequately treated congenital syphilis could be confirmed). All the parasitic infections were post-adoption diagnoses.

Regarding the dermatological pathology, two patients had in their reports major vascular malformations that were the reason for adoption via SN (a dorsal hemangioma and a cervicobrachial hemangioma), both of which were confirmed on arrival.

Four new cases of endocrinopathies were diagnosed during the medical assessment and follow-up (one case of hypothyroidism, one of precocious puberty, and two of methylcrotonylglycinuria). Additionally, another child presented on arrival with an alteration in the metabolism of acylcarnitines (an increase in the C3/C2 ratio in the metabolic screening), that was later improved, probably related to better nutrition after adoption.

Of the five patients with a previous diagnosis of respiratory disease (1 bronchitis, 2 recurrent bronchospasms, 1 tracheitis, and 1 bronchopulmonary dysplasia), only one case of asthma was confirmed post-adoption.

Orthopedic pathology was reported in three children: 2 genu varo that were confirmed and a congenital dislocation of the hips that was not evident upon arrival. However, an undiagnosed genu varo was discovered in a patient with palatal malformation.

In the first post-adoption visit, 23.2% of the children were underweight, and 33.3% were low-height, with 17.5% of adoptees meeting DPSG criteria compared to 1.8% according to the pre-adoption reports.

The results of the most relevant complementary tests from the first visit are presented in Table 2, highlighting the infectious pathology in 17/57 (29.8%) children.

Table 2

Complementary tests performed after first visit upon arrival.

Laboratory tests	
Hemoglobin	Median 13 mg/dL, IQR (12-14)
Anemia	4/56: 7.1%
Iron	Median 29 ug/dL, IQR (20-40)
Iron deficiency (≤ 15 ng/ml)	9/53 (17%)
Eosinophils	Median 195 cél/µL, IQR (147-330)
Eosinophilia (> 500/ml)	7/56 (12.5%)
Microbiology	
Serologies	
Schistosoma spp	7/40 (17.5%)
Strongyloides stercoralis	3/49 (6.1%)
Toxocara canis	3/49 (6.1%)
Positive *Plasmodium* antigen	0/10
CMV IgG	24/28 (85.7%)
Stool studies	
Parasites detected*	7/56 (12.5%)
Ag *Cryptosporidium* o *Giardia lamblia*	1/37 (2.7%)
Tuberculosis screening	
Positive tuberculin skin test	4/54 (7.4%)
IGRA	0/5
Metabolic screening	
Normal	41/44 (93.2%)
Non conclusive	2/44 (4.5%)
Increase in C3/C4 ratio	1/44 (2.3%)

A signed and stamped immunization schedule was provided by 91.2% of the children. Still, only in 7.7% of the patients, this document included all the vaccines recommended for age according to the immunization schedule of their country of origin.

Discussion

In this study in a referral unit in Spain, we confirmed that most of the children seen in our Unit were of Asian origin (96.5%), as previously reported[4]. It was found that the pathologies that led to IA via SN were confirmed in a high percentage of cases, especially when those were major surgical conditions (digestive, cardiac, or palatal malformations). Early correction of major birth defects is essential, but these complex surgeries require close follow-up, which is very difficult in institutionalized children. In our series, intestinal parasitosis and microcephaly were strongly underdiagnosed according to pre-adoption reports, but no other chronic conditions were found. However, adoptive parents should know that the information provided by the institutions do not always offer complete accuracy, largely due to limited resources and healthcare unavailability in the country of origin.

There is a consensus that internationally adopted children should be evaluated by pediatricians with experience in the field. Most protocols agree on the importance of a thorough medical history upon arrival, an exhaustive physical examination, and complementary tests, followed by completion of the immunization schedule[10,11]. In children with SN, the particular conditions of each individual case should be considered, and patients should be referred to specialists for proper multidisciplinary management[2,]. Multidisciplinary units with experience in IA are the most appropriate place to attend to these children upon arrival in the new home country and program the necessary follow-up.

According to the pre-adoption report, only one patient in our series had DPSG. At the same time, in the first visit to our Unit, 17.5% presented DPSG. Growth delay might be multifactorial and might be related to insufficient nutritional intake and emotional disorders. Especially worrisome is the high rate of underdiagnosed microcephaly (17 patients) in the post-adoption consultation. Microcephaly might also be related to emotional and bond disorders, but differential diagnosis is wide. In any case, it deserves close monitoring to achieve a prompt diagnosis of neurological disorders, if present. The high prevalence of microcephaly and underweight in children from IA has already been described in previous series and interpreted as a sign probably related to direct consequences of the medical conditions and the emotional depletion suffered. Psychological support is essential to improve language, communication, and social skills. Internationally adopted children have a higher risk of school failure than non-adopted children of the same socioeconomic profile[,].

As described in other series[2,17] the most prevalent infections in our patients were intestinal parasitosis (8/57), followed by a positive serology result for schistosomiasis (7/40), strongyloidiasis (3/49), or toxocariasis (3/49). Upon arrival in the new home country, the infectious screening must be individualized, tailored to the origin and previous living conditions. Most parasitoses are linked to poor hygienic-sanitary conditions and can be treated[2,17]. Moreover, intestinal parasite infections in early childhood have recently been associated with later behavioral problems. Of the six children diagnosed with congenital infection, only one case of correctly treated congenital syphilis was confirmed. These findings highlight the importance of performing a complete infectious diseases screening of IA children to confirm presumptive diagnoses and rule out other pathologies previously non diagnosed[17]. Among other infectious diseases, screening for TB in adoptees is essential since they come primarily from endemic areas. There is controversy about the convenience of the different diagnostic tests[17]. In our study, the absence of LTBI is striking, different from what is described in other series. However, it may be explained by the younger age of our patients and/or by the isolation of the minors with SN, possibly with little contact with other institutionalized children.

Velopalatine malformations, such as cleft lip and palate, are one of the most prevalent conditions in our series, very frequently described in series of adopted children with SN[2]. Skin conditions are also frequently described in adoptees.

Children with chronic conditions are often not adequately vaccinated. In our series, only 7.7% had a complete immunization schedule for their age and country of origin. Additionally, the immunization record is not very accurate, and the vaccines received in their country of origin are minimal. It is always advisable to adapt the immunization of these children with the necessary doses depending on their age.

Our study has several limitations, such as the retrospective design, with the constraints that this entails. Besides, most reports are concise or even just summaries of the previous diagnosis arranged by non-medical staff. Data regarding personal and family history are usually absent. In other cases, reports can be challenging to interpret due to poor translation[3]. However, we present one of the most extensive series of internationally adopted children with SN, describing their clinical and epidemiological characteristics.

Conclusion

According to our results, the pre-adoption reports are reliable, confirming the pathology described in more than 75% of cases. The most frequently reported diseases were mild neurological and hematological ones. However, upon arrival, height and growth delays were common and underdiagnosed as well as microcephaly and infectious diseases.

Internationally adopted children with SN constitute a challenge for both healthcare professionals and adoptive parents, who must be aware of the difficulties that may arise. Clinical and psychological support should be provided through the whole adoption process, ideally in specialized units with experienced multidisciplinary teams, able to provide comprehensive care to these minors.

References

1. Ministry of Health, Consumer Affairs and Social Welfare, November the 17th, 2020. Online 30.03.2021): https://www.mscbs.gob.es/ssi/familiasInfancia/Infancia/adopciones/adopInternacional/pdf_nuevos/2019_ESTADISTICAS_datos_2015_2019.pdf
2. Obringer E, Walsh L. Infectious Diseases and Immunizations in International Adoption. *Pediatr Ann*. 2017;46(2): e56-e60. Doi:10.3928/19382359-20170117-01
3. Dartiguenave C. Adoption internationale: évolution des risques de santé chez les enfants [International adoption: children's health risk evolution]. *Bull Soc Pathol Exot*. 2012;105(2):109-114. Doi:10.1007/s13149-012-0215-3
4. Cochran ME, Nelson KR, Robin NH. International adoption of children with birth defects: current knowledge and areas for further research. *Curr Opin Pediatr*. 2014;26(6):621-625. Doi:10.1097/MOP.0000000000000144
5. Carrascosa Lezcano A, Fernández García JM, Fernández Ramos C, et al. Spanish cross-sectional growth study 2008. Part II. Height, weight and body mass index values from birth to adulthood. *An Pediatr*. 2008;68(6):552-569. Doi:10.1157/13123287
6. Nutrition Landscape Information System (NLiS) country profile indicators: interpretation guide, 2nd edition. Geneva: World Health Organization; 2019. Licence: CC BY-NC-SA 3.0 IGO.
7. C. Fernández, H. Lorenzo, K. Vrotsou, et al. Estudio de Crecimiento de Bilbao. Curvas y tablas de crecimiento (estudio transversal). Bilbao, España: Fundación Faustino Orbegozo. 2011.
8. Mellado Peña MJ, Santiago García B, Baquero-Artigao F, et al. Tuberculosis treatment for children: An update. *An Pediatr*. 2018;88(1):52.e1-52.e12. Doi: 10.1016/j.anpedi.2017.05.013.
9. Oliván Gonzalvo G. Adoption in China of children with special needs: the "green passage". *An Pediatr*. 2007;67(4):374-377.
10. García López Hortelano M, Mellado Peña MJ. International adoption in Spain: Current situation. *An Pediatr*. 2015;82(5):291-2. Doi: 10.1016/j.anpedi.2015.01.007.
11. Goutines J, Miller LC, Sorge F. Infections and nutritional status of internationally adopted children in France. *Acta Paediatr*. 2021;110(4):1359-1365.
12. Robert M, Carceller A, Domken V, et al. Physical and neurodevelopmental evaluation of children adopted from Eastern Europe. *Can J Clin Pharmacol*. 2009;16(3):e432-40.

13. Hwa-Froelich DA, Matsuo H, Jacobs K. False Belief Performance of Children Adopted Internationally. *Am J Speech Lang Pathol*. 2017;26(1):29-43. Doi:10.1044/2016_AJSLP-15-0152
14. Hwa-Froelich DA, Matsuo H. Pragmatic Language Performance of Children Adopted Internationally. *Am J Speech Lang Pathol*. 2019;28(2):501-514. Doi:10.1044/2018_AJSLP-18-0075
15. [1]Buonsenso D, Graffeo R, Scarlato L, et al. Intestinal Parasitic Infections in Internationally Adopted Children: A 10-Year Retrospective Study. *Pediatr Infect Dis J*. 2019;38(10):983-989. Doi:10.1097/INF.0000000000002399
16. Desoubeaux G, Collin-Dorca A, Guillon-Grammatico L, et al. Gastrointestinal parasitic carriage in adopted children. *Arch Pediatr*. 2016;23(7):685-694. Doi:10.1016/j.arcped.2016.04.005
17. Van Kesteren L, Wojciechowski M. International adoption from Ethiopia: An overview of the health status at arrival in Belgium. *Acta Clin Belg.* 2017;72(5):300-305. Doi:10.1080/17843286.2016.1258178
18. Nielsen AV, Kjærgaard J, Pedersen TM, et al. Infectious diseases detected by screening after arrival to Denmark in internationally adopted children. *Acta Paediatr*. 2020;109:1004–1010. Doi:10.1111/apa.15045
19. Pascal J, Décombas-Marion M, Poirier V, et al. International Adoption of Children Surviving the Haitian Earthquake. *Disaster Med Public Health Prep*. 2018;12(4):450-454. Doi:10.1017/dmp.2017.109
20. Heikkilä AR, Elovainio M, Raaska H, et al. Intestinal parasites may be associated with later behavioral problems in internationally adopted children. *PLoS One*. 2021. 25;16(1):e0245786.
21. Trehan I, Meinzen-Derr JK, Jamison L, et al. Tuberculosis screening in internationally adopted children: the need for initial and repeat testing. *Pediatrics*. 2008;122(1):e7-e14. Doi:10.1542/peds.2007-1338
22. Spicer KB, Turner J, Wang SH, et al. Tuberculin skin testing and T-SPOT.TB in internationally adopted children. *Pediatr Infect Dis J*. 2015;34(6):599-603. Doi:10.1097/INF.0000000000000680
23. M-Echevarría A, Sainz, T, García-Hortelano M, et al. Usefulness of Interferon-gamma Release Assays in the Screening of Latent Tuberculosis Infection in Immigrant and Internationally Adopted Children. *Pediatr Infect Dis J*. 2015;34(10):1141-1142. Doi:10.1097/INF.0000000000000831
24. Chiappini E, Zaffaroni M, Bianconi M, et al. Italian multicentre study found infectious and vaccine-preventable diseases in children adopted from Africa and recommends prompt medical screening [published online ahead of print, Jan 24,2018]. *Acta Paediatr*. Doi:10.1111/apa.14237
25. Whitaker-Worth DL, Bayart CB, Benedetti JA. Dermatologic conditions in internationally adopted children. *Int J Womens Dermatol*. 2015;1(1):31-36. Doi:10.1016/j.ijwd.2014.12.003
26. Garcia-Fernandez M, Mellado-Peña MJ, Delgado-Hierro A, et al. Greater efforts are needed to ensure that children with complex medical conditions are properly vaccinated. *Acta Paediatr*. 2020;109(2):422-423.
27. Bechini A, Boccalini S, Alimenti CM, et al. Immunization Status against Measles, Mumps, Rubella and Varicella in a Large Population of Internationally Adopted Children Referred to Meyer Children's University Hospital from 2009 to 2018. *Vaccines.* 2020, 8, 51; Doi:10.3390/vaccines8010051
28. Álvarez García FJ, Cilleruelo Ortega MJ, Álvarez Aldeán J, et al. Immunisation schedule of the Pediatric Spanish Association: 2021 recommendations. *An Pediatr*. 2021;94(1):53.e1-53.e10.

Figures

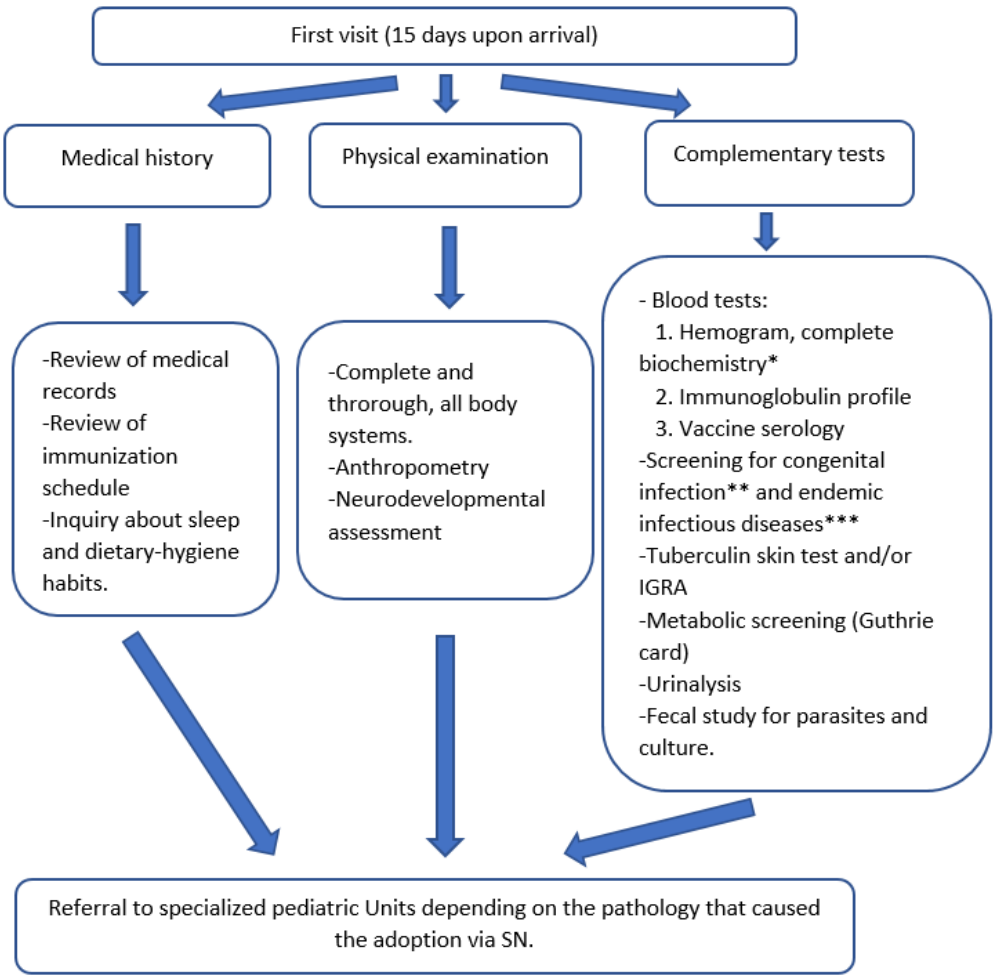

Figure 1

Management protocol for IA children with SN from the International Adoption Unit of the Pediatrics, Infectious and Tropical Diseases Service (Children's Hospital La Paz – Carlos III). *Basic biochemistry, liver and kidney function. Consider ionogram, ferric profile, vitamin D, immunoglobulins G, A and M. Rickets screening: alkaline phosphatase, calcium, phosphates. **CMV, Toxoplasma, HIV, hepatitis B, hepatitis C, syphilis. ***Strongyloides, Schistosoma, Toxocara, malaria.