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Effects of Massage Therapy and Kinesitherapy to Develop Hospitalized Preterm Infant's Anthropometry: A Quasi-Experimental Study

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ABSTRACT

Purpose: The aim of this study was to analyze the efficacy of massage therapy and kinesitherapy on the anthropometric development of hospitalized preterm infants applied by parents.
Design and methods: A prospective quasi-experimental study was designed. Hospitalized preterm infants received a daily 15-minute session of massage therapy and kinesitherapy. The control group received regular medical and nursing care.
Results: The massage therapy and kinesitherapy protocol significantly improved the anthropometric parameters studied: weight (895.7 ± 547.9 vs 541.8 ± 536.2; $p < 0.001$) size (5.5 ± 4.3 vs. 3.0 ± 3.1; $p < 0.001$) and head circumference (4.2 ± 3.2 vs 2.4 ± 2.6; $p < 0.001$).
Conclusions: The implementation of a massage therapy and kinesitherapy protocol is beneficial for the anthropometric development of hospitalized preterm infants.
Practice implications: An easy to administer and cost-effective intervention such as massage therapy and kinesitherapy can improve the anthropometric development of preterm infants and reduce growth-related morbidity in the short, medium, and long term.

Introduction

Preterm births have become a first-rate health problem, to the extent that the World Health Organization (WHO) considers them a fundamental problem of public health throughout the world (Qureshi, 2007).

According to the latest data published by the Division of Reproductive Health of the National Center for Chronic Disease Prevention and Health Promotion (Martin, Hamilton, & Osterman, 2018) referring to the year 2016 in the United States of America, the preterm birth rate was 9.85%. During the same year, the rate of premature births in Spain was 7.35%, based on data from the National Institute of Statistics (INE, 2018) Developed countries have considered prematurity as a priority in their health policies, as it is the first cause of infant mortality and has a significant risk of disability throughout life associated to its occurrence (March of Dimes et al., 2012).

A very important group of sequelae associated with prematurity is represented by respiratory problems (in the form of respiratory distress and bronchopulmonary dysplasia) cognitive and neurological morbidity (prematurity is the leading cause of infantile cerebral palsy and is also associated with learning disorders) sensory alterations (mainly at visual and auditory level) and restrictions of the anthropometric development (relating to the weight, size, and head circumference) (Cardoso-Demartini et al., 2011; Islam, Keller, Aschner, Hartert, & Moore, 2016, Johnson et al., 2015) In preterm infants, postnatal anthropometric growth restriction has been considered a global problem, regardless of the country, the level or category of the center where the birth takes place (García-Muñoz, Figueras, Saavedra, & García-Alix, 2016) (p. 2).

The preterm infant, in addition to the immaturity inherent to prematurity, is deprived of the cutaneous stimulation provided by the intrauterine development through skin contact with amniotic fluid and uterine walls at an early stage. It has been proven that these perceptions are involved in the proper growth and neurodevelopment of the child (Im & Kim, 2009; Niemi, 2017) A factor that is associated with this

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early sensory deprivation is prematurity, which determines the absence of continued contact between the parents and the infant due to the need to stay in the Neonatal Intensive Care United (NICU) or in an incubator (Brett, Staniszewska, Newburn, Jones, & Taylor, 2011; Synnes et al., 2017)

What is known of all these factors has determined that, over the past years, many hospital units for preterm infants have begun to carry out a series of caring measures focused on somatic and kinesthetic stimulation with the objective of promoting an enrichment of the hospital environment and facilitating the proper development of preterm infants (Alvarez et al., 2017; Field, Diego, & Hernández-Reif, 2010; Niemi, 2017; Pallás & Arriaga, 2008).

These interventions are in line with the principles of the Neonatal Individualized Developmental Care and Assessment Program (NIDCAP) to achieve the objective of adapting stimuli that preterm infants receive to their degree of brain maturation and creating a similar environment to the intrauterine one (Haumont et al., 2013; Kaye, 2016). Based on the NIDCAP model, the clinical applications of massage therapy for premature infants are addressed in two main ways: providing balanced somatic stimulation and increasing parental involvement.

The majority of research on somatic and kinesthetic stimulation in preterm infants coincides in pointing out a benefit on factors related to the growth of premature infants (Diego et al., 2007; Field et al., 2008; Gonzalez et al., 2009; Jabraeile, Rasooly, Farshi, & Malakouti, 2016; Kumar et al., 2013; Massaro, Hammad, Jazzo, & Aly, 2009; Niemi, 2017; Saeadi, Ghorbani, & Moghaddam, 2015) Among the causes that justify these anthropometric benefits, some authors point to the increase in vagal activity (Diego et al., 2007; Diego, Field, & Hernandez-Reif, 2005; Field et al., 2008) the increase in gastric activity (Diego et al., 2005; Diego et al., 2007) or the increase in serum insulin levels and insulin-like growth factor-1 (IGF-1) (Field et al., 2008)

In some cases, an increase in weight was observed at the time of finalizing the application of the massage protocol and/or upon discharge (Diego et al., 2007; Guzzetta et al., 2009; Jabraeile et al., 2016; Massaro et al., 2009) and others found benefits at month and/or at 2 months of age (Akhavan, Golestan, Fallah, Golshan, & Dehghan, 2013; Arora, Kumar, & Ramji, 2005; Fallah, Karbasi, Golestan, & Fromandi, 2013).

This effect on anthropometric parameters has important implications in the overall development of the child, since previous studies have shown the relationship infants body size and their cognitive, psychomotor and academic status.

Egashira and his collaborators (Egashira et al., 2018) found that a larger size and a better cephalic perimeter were very important indicators for a better psychomotor development in children who had been born with very low weight (Egashira et al., 2018) The low, very low and insufficient weight is also related to an increased risk for cerebral maturation and failure cognitive development and the restriction in the growth of the head circumference determines a lower cerebral volume and a lower intellectual development (Villegas et al., 2009)

Postnatal growth problems demonstrate lower cognitive scores and academic achievement at 3 (Egashira et al., 2018) at 7 (Dotinga et al., 2019) and 8 years of chronological age (Casey, Whiteside-Mansell, Barrett, Bradley, & Gargus, 2006).

Purpose

This study was conducted with the aim of analyzing the efficacy of massage therapy and kinesitherapy on the anthropometric development of hospitalized preterm infants applied by parents.

Method

Design and sample

This was a quasi-experimental study of community intervention.

The study population consisted of preterm infants (<37 weeks of gestation) hospitalized in the NICU or the Unit of Premature of the Pediatrics Service of the University Hospital of León (Spain), with a survival rate of >48 h and who met the following inclusion criteria: weight between 1.250 and 2.249 g, hemodynamic stability, intact skin, stable parameters (heart rate, respiratory rate, blood pressure, oxygen saturation and peripheral body temperature) absence of genetic and congenital anomalies (heart defects, neural tube abnormalities, Down syndrome and other chromosomal alterations, diaphragmatic hernia and gastrointestinal anomalies) absence of disorders of the central nervous system, and hemodynamic stability of disorders of the central nervous system.

The exclusion criteria were: family refusal to participate in the study, high-frequency mechanical ventilation, $FiO_2 > 70\%$, inotropic support, septic shock, persistent tachycardia, persistent bradycardia, and gastrointestinal disorders.

The intervention group ($n = 54$) was formed by preterm infants that met the inclusion criteria. Subjects assigned to this group received, on a daily basis, a program of massage therapy and kinesitherapy of 15 min by their parents, after a previous process of training.

The control group ($n = 82$) was composed by preterm infants that met the inclusion criteria The infants assigned to this group received regular medical and nursing care from the corresponding unit.

Setting

The study was conducted in the period between January 2014 and December 2015, both months included.

Infants born between January 2014–June 2014 and July 2015–December 2015 were included in the control group. Preterm infants born between July 2014 and June 2015 were included in the intervention group.

The study was conducted over two consecutive years. A convenience sample of 54 and 82 preterm infants in the interventional and control group were recruited.

Ethical Issues

To carry out all phases of the research project, the study was approved by the Ethics Committee of Clinical Research of León, Spain (Health Department of Castilla y León -Sacyl-, Ministry of Health). The participation in the study was always preceded by a detailed explanation of study and a request for participation. The father, mother or legal representative of the infant who agreed to participate, gave their informed written consent. All of the research was conducted following the recommendations of the Declaration of Helsinki on clinical trials in humans.

Data collection process

The socio-demographic variables and obstetric characteristics were collected on a questionnaire developed by the researchers. It included aspects such as the age of the parents, rural or urban origin, if the mother had smoked during pregnancy (and, if so, until what week of pregnancy and how many cigarettes per day) and if she had been exposed to tobacco smoke at home, at work, or during her leisure time.

Regarding the infant and the obstetric birth circumstances, data such as sex and the gestational age of the newborn, the Apgar score at minutes 1 and 5, as well as the umbilical cord blood pH levels were collected from the clinical history of childbirth. Also, the number of previous pregnancies and the number of live births was recorded.

For the registration of anthropometric variables of the anthropometric measures, the recommendations of the WHO (2008) were followed.

Weight

Weight was measured at the time of birth and every day until the moment of hospital discharge. Preterm infants were always weighed

at the same time (at 6 pm) and in the same conditions (1 h after the last feed). This action was carried out without clothes or diaper, and the child was placed on a scale, in the supine position, without any contact of the hands and feet with any surface. A digital pediatric scale was used, Seca brand (model 834) with a mean range between 0 and 20 kg, an accuracy of 10 g for weights lower than 10 k, and an accuracy of 20 g for weights equal to or higher than 10 kg.

Size and head circumference

The size and the head and chest circumference measurement was determined with a flexible and inextensible measuring tape with a range of 0 to 150 cm and divisions each 0.01 cm. Both parameters were measured at the moment of birth and at discharge from hospital.

For the measurement of the size, two people were involved: one of them held the head in the Frankfurt plane position and the second person kept the knee in extension and firmly fastened the foot in neutral position. The distance between the cranial vertex and the plantar plane was measured.

The circumference was measured around the superciliary arches and the most prominent area of the occipital (opisthocranion).

Intervention

Parents of preterm infants in the intervention group were trained by the nursing staff involved in the development of the project, during the first 48 h of the child's life for the administration of the massage therapy and kinesitherapy protocol. The parents received two individual training sessions of 45 min each. In addition, the parents received a triptych that graphically detailed the different stages of the intervention, described the hand-washing protocol and included information about the website of the research project where parents could find a video demonstration explaining the application of the massage therapy and kinesitherapy protocol (http://www.premas.es/es/noticias/item/32-tecnicas-de-masaje-a-prematuros.html).

The intervention consisted of a massage therapy and kinesitherapy protocol of 15 minute total which was published by Tiffany Field and the corresponding research group (Field et al., 1986) and which was used in six more studies on a population of hospitalized preterm infants (Ang et al., 2012; Asadollahi, Jabraeili, Mahallei, Asgari-Jafarabadi, & Ebrahimi, 2016; Diego et al., 2005; Field et al., 2008; Ho, Lee, Chow, & Pang, 2010; Lai et al., 2016) The application of the massage and kinesitherapy was made directly skin-to-skin, without the use of gloves or lotions, oils, or other contact solutions.

Each treatment session was divided into three phases of 5 min each. During the first and third phases (massage therapy phases), the premature neonates were massaged for 5 min, spending 1 min in each part of the body by following the sequence: 1) from the top of the head to the neck; 2) from the neck across the shoulders; 3) from the upper back to the waist; 4) from the thigh to the foot, on both legs; and 5) from the shoulder to the hand, on both arms. During the kinesitherapy phase (second phase), the preterm infant was placed in a supine position and each arm, each leg, and finally both legs together, were flexed and extended for 1 min in each segment.

Prior to the start of each session, the parent responsible for the application of the massage and kinesitherapy wore a sterile disposable gown and had his/her hands and wrists free of accessories. This parent thoroughly washed his/her hands, according to the recommendations of the WHO (2010), with antiseptic soap and running water, using a disposable paper towel for drying. The handwashing process was supervised by the nursing staff involved in the development of the project.

Data analysis

Statistical analyses were performed using Stata 14 for Mac and EpiInfo™ 7.2 for Windows.

For the descriptive analysis, the mean, standard deviation, minimum and maximum values were calculated for the quantitative variables, and the relative frequencies with their confidence intervals of 95% and percentages for the different values for the qualitative variables. For the quantitative variables, the normality tests by Shapiro-Wilk and Kolmogorov-Smirnov were applied, and those variables whose bilateral asymptotic significance was greater than or equal to 0.05 were considered to be normally distributed and were expressed as mean and standard deviation.

To compare the quantitative variables with normal distribution, the Student's parametric *t*-test was used for independent samples. The non-Gaussian variables were compared to the non-parametric Mann Whitney *U* test. For the comparison of related samples, the Student's t-test and the Wilcoxon test were used. For the qualitative variables' analysis, contingency tables were used and the Chi-square or Fisher's test was calculated. The stratified analysis was performed with the Mantel-Haenzsel test. In addition, the odds ratio (OR) and their 95% confidence intervals were calculated.

Results were assessed at 95% confidence interval, and significance was determined as $p < 0.05$.

Results

Description of participants

A total of 136 preterm infants participated in the study: 82 in the control group and 54 in the intervention group. Both study groups were similar regarding all baseline variables. The mean of gestational weeks was 32.1 (SD = 4.1). The general characteristics of preterm infants and their mothers organized by study group are given in Table 1.

Anthropometric measurements at birth and discharge

A total of 136 anthropometric measurements were performed: 82 in the control group and 54 in the intervention group, at the moment of birth and at discharge from the hospital.

Table 2 shows the anthropometric measurements at birth organized by groups. There were statistical differences in both groups; all parameters analyzed had lower values in the intervention group.

At discharge from hospital, the anthropometric measurements showed no statistical differences between the variables. Table 3 showed anthropometric measurements organized by groups at the moment of discharge from hospital.

Table 1
Demographic and neonatal data of the study population.

		Control group (n = 82)	Intervention group (n = 54)	p-Value
Sex[a]	Male	49 (59.8)	25 (46.3)	0.190
	Female	33 (40.2)	29 (53.7)	
Origin[a]	Rural	47 (57.3)	20 (37.0)	0.155
	Urban	35 (42.7)	34 (63.0)	
Presentation[a]	Cephalic	57 (71.3)	42 (74.1)	0.257
	Other	25 (28.7)	12 (25.9)	
Maternal smoking[a]	No	70 (85.3)	47 (86.4)	0.767
	Yes	12 (14.7)	7 (13.6)	
Apgar 1 min[b]		8.1 ± 1.7	7.4 ± 1.9	0.065
Apgar 5 min[b]		9.1 ± 1.8	9.0 ± 1.2	0.238
Umbilical cord pH[b]		7.3 ± 0.1	7.3 ± 0.08	
Mother's age (years)[b]		34.0 ± 6.1	33.2 ± 4.9	0.712
Father's age (years)[b]		32.1 ± 2.8	33.9 ± 4.7	
Gestational age (days)[b]		231.4 ± 37.3	222.8 ± 20.9	0.293
Previous pregnancies[b]		0.3 ± 0.8	0.4 ± 0.6	0.148

Statistical tests employed: Student's *t*-test, Mann-Whitney, Chi-Square, and Fisher's exact Test.
[a] n(%).
[b] Mean ± SD.

Table 2
Anthropometric measures at birth organized by groups.

	Control Group					Intervention Group					p-Value
	n	Mean	SD	Min	Max	n	Mean	SD	Min	Max	
Weight (gr)	82	1.898.2	486.5	840	3370	54	1.483.8	458.3	660	2.280	<0.001[a]
Length (cm)	82	43.5	3.8	32	50	54	40.6	4.5	31	49	<0.001[b]
Cephalic index (cm)	82	30.6	2.4	22	35.2	54	28.7	2.7	22	33	<0.001[b]

Statistical tests employed: [a] Student's *t*-test. [b] Welch test.

Effect of the intervention on the anthropometric parameters

In the intervention group, all the anthropometric measurements were higher than in the control group.

In the intervention group, preterm infants gained 895.7 (SD = 547.9) grams of weight, 5.5 (SD = 4.3) centimeters of length and 4.2 (SD = 3.2) centimeters of head circumference. In the control group, preterm infants gained 541.8 (SD = 536.2) grams, 3.0 (SD = 3.1) centimeters of length and 2.4 (SD = 2.6) centimeters of head circumference.

The intervention outcomes for preterm infants were statistically significant in all the analyzed anthropometric parameters (Table 4).

The results of the study may be affected by the presence of confounding variables such as the presence of diseases related to the neonatal period or the quality of the massages applied by parents.

Discussion

This study investigated the efficacy of massage therapy and kinesitherapy, applied by parents, on the anthropometric development of hospitalized preterm infants. Results showed that the massage therapy and kinesitherapy protocol significantly improved anthropometric parameters studied.

Most studies that have assessed the effects of somatic stimulation in preterm infants include one or more anthropometric parameters for the evaluation of the results. Among the causes that could justify the benefits on growth, some authors have noted the increase in vagal activity (Diego et al., 2005; Diego et al., 2007; Field et al., 2008) increased gastric activity (Diego et al., 2005; Diego et al., 2007) or increased serum levels of insulin and IGF-1 (Field et al., 2008)

The most frequently used anthropometric parameter has been the weight (Akhavan et al., 2013; Arora et al., 2005; Diego et al., 2007; Fallah et al., 2013; Ferreira & Bergamasco, 2010; Field et al., 2008, Fucile & Gisel, 2010; Gonzalez et al., 2009; Ho et al., 2010; Kumar et al., 2013; Massaro et al., 2009; Mendes & Procianoy, 2008; Moyer-Mileur, Haley, Slater, Beachy, & Smith, 2013; Alves De Barros et al., 2018). Some authors have also noted other somatometric parameters such as head size and circumference (Akhavan et al., 2013; Arora et al., 2005; Fallah et al., 2013; Guzzetta et al., 2009; Kumar et al., 2013; Massaro et al., 2009; Moyer-Mileur et al., 2013; Procianoy, Mendes & Silveira, 2010), and two investigations have included the determination of the triceps skinfold thickness (Arora et al., 2005; Moyer-Mileur et al., 2013).

In the present study, the intervention had a favorable and significant effect on the three anthropometric parameters studied (size, weight, and head circumference).

The weight increase in the intervention group, from birth until discharge from hospital, was 895.7 g (SD = 547.9) (Table 4) In the year 2011, a study (Kumar et al., 2013) showed the positive effect of a massage program applied with essential oils on the weight variable, with an increase of 476.7 g (SD = 47.9) In the intervention group, this happened when it was recorded at 28 days of life. Therefore, the average weight increase per day would be 17 g, a slightly lower value than that recorded in the present study 26.7 g (SD = 6.7).

Research published by Fucile and Gisel (2010) achieved a significant increase in weight per day of hospitalization in preterm infants who had received an oral somatic stimulation, 17.4 g (SD = 6.1) and in those who had participated in a program of somatic and kinesthetic stimulation: 17.6 g (SD = 3.8) as well as those to which both interventions had been applied (15.7 ± 4.6 g) compared to the control group (12.6 ± 5.9; p = 0.014) The duration of the intervention was 10 days and, in this case, we can also observe slightly lower values than those obtained in our research.

Saeadi et al. (2015) also obtained weight benefits after applying a massage protocol in hospitalized preterm infants, but the average gained per day was lower than the one obtained in present study, both in the group in which they performed the massage (54 ± 1.3 g gained in 7 days) and in the group in which they applied the massage with essential oils (105 ± 1.3 g gained in 7 days).

Other studies that measured the effects of a program of massage therapy and/or kinesitherapy on anthropometric parameters showed higher weight, size, and head circumference values in the intervention group than in the control, but the differences were not significant (Arora et al., 2005; Fallah et al., 2013)

The present study, as has already been said, achieved an increase in the size and head circumference at discharge from hospital as compared to the moment of birth with statistical significance when the control group and the intervention group were compared.

Of all the studies included in a systematic review published in 2017 (Alvarez et al., 2017) none could demonstrate statistically significant differences in size and head circumference; in all of them, unlike the present study, there were no significant differences in height and head size at birth (Akhavan et al., 2013; Arora et al., 2005; Fallah et al., 2013; Guzzetta et al., 2009; Massaro et al., 2009; Mendes & Procianoy, 2008; Moyer-Mileur et al., 2013).

There is indeed the consensus among the scientific literature that, of all the somatometric parameters, size shows a greater restriction, both

Table 3
Anthropometric measures at hospital discharge organized by groups.

	Control group					Intervention group					p-value
	n	Mean	SD	Min	Max	n	Mean	SD	Min	Max	
Weight (gr)	82	2.440.0	271.2	2120	3300	54	2.379.5	240.6	2.080	3.240	0.361[a]
Length (cm)	82	46.5	2.1	41	52.5	54	46.1	1.7	43	49.5	0.26[a]
Cephalic index (cm)	82	33.0	1.3	30	37	54	32.9	1.1	30	35.5	0.932[a]

Statistical test employed: [a] Student's *t*-test.

Table 4
Comparison of the increase of anthropometric parameters between groups.

	Control			Intervention			p-Value
	n	Mean	SD	n	Mean	SD	
Increase of weight (gr)	82	541.8	536.2	54	895.7	547.9	<0.001[a]
Increase of length (cm)	82	3.0	3.1	54	5.5	4.3	<0.001[a]
Increase of cephalic index (cm)	82	2.4	2.6	54	4.2	3.2	<0.001[a]

Statistical test employed: [a] Mann-Whitney's test.

in the short and long term (Embleton, Pang, & Cooke, 2001; Ziegler, 2011; Olsen, Harris, Lawson, & Berseth, 2014; Olsen et al., 2017) Therefore, the intervention proposed in this study can be a useful tool to facilitate the normalization of size in hospitalized preterm infants.

Although the head circumference is the variable that less affects preterm infants, the EPIcure study (Bracewell, Hennessy, Wolke, & Marlow, 2008) showed that this parameter remained below the average (−1.3 SD) even when the children were already 6 years old. The statistical positive effect of the massage therapy and kinesitherapy protocol of this investigation (Table 4) on the head circumference could result in a decrease in neurological, cognitive, and sensory morbidity, as it is shown that preterm infants that have a lower head circumference present more risk of visual disturbances, delayed motor development, cognitive deficits, academic difficulties, etc. (Foulder-Hughes & Cooke, 2003).

We consider that the results of this study contribute to the evidence that supports the use of massage and kinesitherapy to facilitate the premature newborns' growth. Additionally, this intervention is of very low cost, without side effects, and with an easy application and integration into the care of hospitalized premature newborns. The results obtained, not only in terms of weight, but also on the favorable effect on height and cephalic perimeter, constitute a new finding. This is the first study that provides benefits of massage therapy on the three most important aspects in the development of body size of the premature children.

The main limitation of this study was the methodological design. It was decided to conduct a non-randomized clinical trial with the aim of not excluding preterm infants who shared space and time. All the incubators were located together in a single room and there were only 2 h of visit per day appointed (1 h in the morning and another hour in the afternoon). This meant that parents shared the same space at the same time. This decision meant a loss of methodological quality as it resulted in a lack of homogeneity between the control and the intervention group. This heterogeneity resulted in statistically lower data at the birth moment (weight, length and cephalic index) This fact, that could have maximized the effect of the intervention, may also make it difficult to determine the actual magnitude of the intervention effect and the comparison of the results with other investigations.

The experimental design of this investigation (a quasi-experimental study) potentially resulted in artificially greater effect of massage/kinesitherapy on the length and head size. The beginning data (Table 2) of the intervention group was so much less than the control group, so it is possible to assume that this has resulted in exaggerating the effect of the intervention (Table 4) In order to continue to test the effectiveness of this intervention, it should be investigated using randomized control trials.

Conclusion

The application of a massage therapy and kinesitherapy protocol performed by parents of hospitalized preterm infants has potentially significant positive effects on their anthropometric development as for weight, size, and head circumference.

Clinical relevance

The extrapolation of the conclusions of this study to daily care practice in the preterm and neonatal intensive care units could lead to the implementation of therapeutic measures based on somatic and kinesthetic stimulation, which involve parents in the care of their children right from the hospital admission stage. This therapeutic option is a low-cost measure, which is fully in line with the contemporary theories that advocate for care focused on neonatal development and early involvement and training of parents (NIDCAP) Massage and kinesitherapy is a potentially effective technique so as to reduce the morbidity associated with restriction in the anthropometric development of preterm infants.

Nurses can play an active role in the training of parents for the application of the massage, in the supervision of its application, in the administration of the intervention when parents are absent, in assessing the outcomes of the intervention and in the involvement of parents in the care of their children from the hospitalization stage.

Conflicts of interest and source of funding

No conflicts of interest are declared.
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CRediT authorship contribution statement

María José Álvarez: Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing - original draft. **Dolores Rodríguez-González:** Data curation, Formal analysis, Methodology, Visualization, Writing - original draft. **María Rosón:** Data curation, Formal analysis. **Santiago Lapeña:** Data curation, Formal analysis, Methodology, Resources. **Juan Gómez-Salgado:** Conceptualization, Funding acquisition, Investigation, Methodology, Writing - original draft, Writing - review & editing. **Daniel Fernández-García:** Conceptualization, Funding acquisition, Investigation, Methodology, Project administration, Software, Supervision, Validation, Visualization, Writing - original draft.

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