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# Spanish research in gender dysphoria: A review of more than 20 years of biomedical literature.

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## ABSTRACT

**Objective.** To provide a bibliometric and contents analyses of the Spanish research in the field of gender dysphoria based on a literature review.

**Method.** Five international and four national databases, and two platforms were used to retrieve publications using the keyword "*gender dysphoria*" and related terms. The results were combined with *Spain* and with the Spanish cities' names with a hospital. The articles published from the *Gender Identity Units (GIUs)* being part of the *National Health System* were selected. The number of citations was assessed using the *Science Citation Index (SCI)* and *Google Scholar*.

**Results.** A total of 179 articles were included. Production shows a progressive increase from 1998 to 2015, and a slight decrease in the following years. 34.6% were published in English, 45.8% were based on set of cases, and the most frequent topic is *psychology* and *mental health* (58.1%). The 75 publications indexed in the *SCI* had received 1,252 citations, and the 152 found in *Google Scholar* reached 3,105 citations. The highest *SCI* average citation per article corresponds to those published in English (22.2), based on *set of cases* (21.1), in the field of *neuroimaging* (52), and coming from the Catalonia *GIU* (25.7).

**Conclusions.** The Spanish research on gender dysphoria produced from the *GIUs* has had a progressive growth, covers many topics, includes a high number of studies based on set of cases, and the number of citations reflect an impact on the scientific community and international leadership in some areas such as *neuroimaging*.

**Key Words.** Bibliometric analysis; Gender dysphoria; Gender Identity; Gender incongruence; Gender Unit; Spain; Review; Transsexualism; Transgender.

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## INVESTIGACIÓN ESPAÑOLA EN DISFORIA DE GÉNERO: UNA REVISIÓN DE MÁS DE 20 AÑOS DE LITERATURA BIOMÉDICA.

### RESUMEN

**Objetivo.** Realizar un análisis bibliométrico y de contenido de la investigación biomédica española sobre disforia de género basado en una revisión de la literatura.

**Método.** Se realizó una búsqueda en cinco bases de datos internacionales, cuatro nacionales, y dos plataformas editoriales, con la palabra clave "*disforia de género*" y términos relacionados. Los resultados se combinaron con *España* y con el nombre de las ciudades españolas con hospital. Se seleccionaron los artículos generados desde las *Unidades de Identidad de Género (UIG)*. El número de citas se evaluó mediante el *Science Citation Index (SCI)* y *Google Scholar*.

**Resultado.** Un total de 179 trabajos fueron incluidos. La producción presenta un incremento progresivo desde 1998 hasta 2015 y un ligero decremento posterior. El 34,6% están publicados en inglés, el 45,8% están basados en casuística de usuarios atendidos, y la temática más frecuente es la *psicología* y *salud mental* (58,1%). Los 75 artículos de revistas incluidas en el *SCI* han recibido 1.252 citas, y los 152 artículos incluidos en *Google Scholar*, 3.105 citas. El mayor número de citas *SCI* por artículo corresponde a los publicados en inglés (22,2), basados en *casuística* (21,1), ámbito de la *neuroimagen* (52), y generados desde la *UIG* de Cataluña (25,7).

**Conclusiones.** La producción científica española sobre disforia de género generada desde las *UIG* ha tenido un crecimiento progresivo, abarca una amplia temática, incluye un elevado número de estudios basados en el análisis de la casuística de la población atendida, y las citas recibidas

reflejan un impacto en la comunidad científica y un liderazgo internacional en algunas áreas como la *neuroimagen*.

Palabras clave. Análisis bibliométrico; Disforia de género; España; Identidad de género; Incongruencia de género; Unidad de Identidad de Género; Revisión; Transexualismo; Transgénero.

## INTRODUCTION

Historically, people that do not identify themselves with their biological sex have been subjected to many difficulties in all areas, including health care services. During the past decades, scientific advances on gender dysphoria, also referred as transsexualism or gender incongruence, and surgical advances, have led to a significant increase in requests for sex reassignment around the world. The socialized healthcare, which began in the Netherlands in 1975 with the creation of the first multidisciplinary unit in Amsterdam, has been gradually established in many European countries, including Spain, where the evolution has been comparable<sup>1</sup>.

In Spain, at the beginning, any sort of healthcare attention for people with gender dysphoria took place in the private system. In 1984 the first two vaginoplasties were performed, and in 1989 the first phalloplasty. In the public system, the advent of healthcare for gender dysphoria within the *National Health System* has occurred sequentially in different autonomous communities through the creation of *Gender Identity Units (GIUs)*<sup>2,3</sup>. In 1999 Andalusia created the first GIU at the *Carlos Haya Hospital* in Malaga (currently *University Regional Hospital* of Malaga). In 2006, GIUs from Catalonia (*Clínica Hospital* of Barcelona), Madrid (*Ramón and Cajal Hospital*), and Aragón (*Miguel Servet Hospital* of Zaragoza) were acknowledged. New units were gradually opened in Asturias (*San Agustín University Hospital* of Avilés, 2007), Basque Country (*Cruces Hospital*, Barakaldo 2008), Valencian Community (*Alicante University Hospital* and *Dr. Peset Hospital* of Valencia, 2008), Canary Islands (*University Hospital* of Tenerife and *Materno Insular Hospital* of Las Palmas, 2008), Navarra (*Complejo Hospitalario Virgen del Camino Hospital* of Pamplona, 2010), and Castilla y León (*University Clinical Hospital* of Valladolid, 2015)<sup>2</sup>. These units have followed and adapted to the evolution of the ethical guidelines recommended by the standards of care of the World Professional Association for Transgender Health (WPATH) of 2001<sup>4</sup> and 2011<sup>5</sup>. They are multidisciplinary GIUs including mental health professionals, endocrinologists, gynecologists, pediatricians and surgeons among others, who work as a team with the aim of offering comprehensive care to patients. In the last two years, there have been changes with new care models focused mainly on primary care and specialists in the area, with less participation of mental health specialists. These changes have resulted in three of these initial GIUs being no longer of compulsory reference for their autonomous community<sup>2</sup>.

Biomedical research on gender dysphoria in the Spanish healthcare system has been favored by the progressive inclusion of its care and treatment in the National Health System and by the creation of GIUs. A previous review that analyzes the scientific production on transsexuality in Spain between 1973 and 2011 finds only 65 biomedical articles published during that period<sup>6</sup>. The study's main strength is that it compiles the first pioneering works produced in Spain, not only in the medical field but also from the social sciences. However, its main limitation is the use of only two Spanish databases, so it does not exhaustively review all existing publications, and it also excludes those studies written in the English language, precisely those of the greatest relevance to the international scientific community. This implies an important bias in its conclusion, stating that there is a shortage of biomedical publications. This requires another review and update.

The objectives of this study are 1) to review the literature and to perform a bibliometric analysis in order to identify the main contributions and the international impact of Spanish biomedical research on gender dysphoria carried out at the national GIUs, and 2) to classify all the scientific production by its content, in order to facilitate the search for information to professionals of health or from other areas of interest, and thus, laying the basis for future research.

## METHOD

### Search profile procedure

The initial search was carried out in 22 databases and publishers analytic services that allowed filtering by author affiliation (Annex A). Finally, five international databases (*Web of Science Core Collection* and *BIOSIS previews*, *Scopus*, *ScienceDirect Citations* and *PsycInfo*), four national (*Dialnet plus*, *Ibecs*, *Psicodoc* and *CUIDEN plus*), and two editorial platforms (*Ovid-Sumaris i resums* and *Taylor & Francis Online*) from the *Center de Recursos per a l'Aprenentatge i la Investigació (CRAI)* of the University of Barcelona were selected. The rest of the consulted sources did not provide any novel reference.

The keywords used and posteriorly adapted to each specific database, were: *transsex \**, *transgender \**, *"sex reassignment"*, *"sexual reassignment"*, *"gender dysphoria"*, *"gender incongruence"*, *"gender disorders"*, and *"gender nonconformity "*, as well as their equivalents in Spanish: *transexual\**, *transgénero\**, *"reassignación sexual"*, *"reassignación de sexo"*, *"disforia de género"*, *"incongruencia de género"*, *"trastornos de género"* y *"disconformidad de género"*. The terms *vaginoplast\**, *faloplast\**, *phalloplast\**, *neovagina*, *intersex\**, *cross-sex*

hormone\*, female-to-male, male-to-female, feminization, sex change y sexual and gender minorities, were discarded as they did not provide new references. The search profile was adapted for the *Thesaurus MeSH (PubMed)*, *APA Thesaurus of Psychological Index Terms (PsychNet)*, and *Descriptores en Ciencias de la Salud DeCS (Bireme)* to combine in the databases (Annex B). Regarding the affiliations, the search included the term Spain in different languages (España, Spain, Espanha, Espagne), as well as cities with hospitals (list based on the web <http://www.hospitalandia.com/>). Throughout the procedure, references provided by the authors themselves or by tracking summaries of some poorly indexed journals were incorporated. All citations without date limits were included.

### Selection of references

In June 2019, the number of references was 2,683, obtained from 22 databases and analytic services (Annex A). The subsequent selection followed a mixed process. Applying Lotka's law<sup>7</sup>, we obtained the list of the 27 most prolific authors. From this list, those belonging to the GIUs were manually identified, obtaining automatically most of the references after 1998. Excluding the references from the most productive authors outside the units, the rest of the citations were filtered manually, selecting those generated from recognized GIUs<sup>2</sup>. The last update was made in April 2020.

All references were included in Mendeley for consistency and treatment. The information about the authors' name, the articles' title, the year of publication, and the name of the journal was downloaded. The final references were exported to a file in .xlsx format. The results are presented according to the flow chart based on the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)* statement.

### Classification of the references and data processing

References information on the authors' name, the title, the year of publication, and journal's name was analyzed in an .xlsx file. Duplicate books or book chapters, doctoral theses, publications of conferences and posters, or those that were not appropriate by subject or authorship, were excluded for bibliometric calculations.

The selected references were assigned according to four classifications: the language of the publication, the type of study, the subject of the study, and the GIU's autonomous community of reference. According to the type of study, the works were classified into: *theoretical*, studies analyzing *set of cases*, *editorials*, *clinical cases*, *letters and responses to the editor*, *qualitative studies*, and *experimental studies*. The *theoretical* category included reflections, opinions, position papers, and reviews. The *set*

of cases category included cross-sectional, case-control, and prospective or retrospective cohort studies. According to the subject of the study, the works were classified into *psychology and mental health*, *endocrinology*, *surgery*, *neurobiological bases*, *epidemiology*, and *public health*. The *neurobiological bases* category was divided into two: *neuroimaging* and *genetics*. To classify by GIU, the affiliation of all authors of each work was analyzed. In the event that authors from different units were part of one work, the assigned GIU unit was that of the first author appearing earlier in the authors' list work.

To reflect the impact of the articles, in May 2020 the number of citations received was searched, that is, the number of times they were cited in other articles for each published work, and their distribution by years, in the *Science Citation Index (SCI)* from the *Web of Science Core Collection*, and in *Google Scholar*. To reflect the relevance of the journals, the *Journal Impact Factor (JIF)* was taken from the *Journal Citation Reports (JCR)*, in the year of publication of each article. For the works published between 2019 and 2020, the last available 2018 JIF was assigned. The comparison of bibliometric characteristics was interpreted from numbers and percentages.

## RESULTS

One-hundred seventy-nine articles from the GIUs were included. The selection process is described in detail in Figure 1. Six books were added that are not included in the bibliometric analysis.

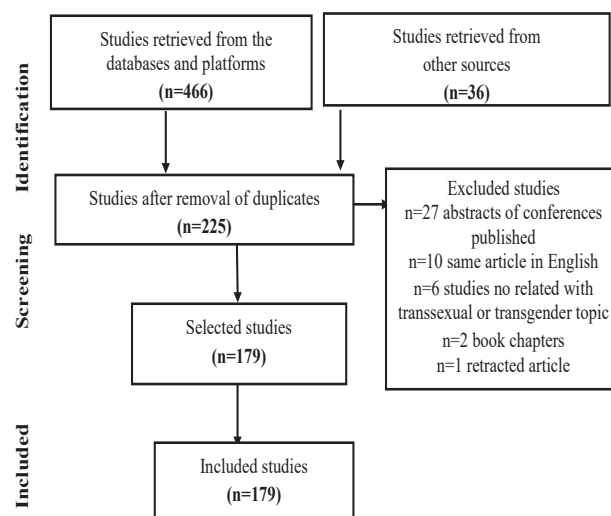


Figure 1 Diagram flow for the studies retrieved from the literature search.

### a) Bibliometric analysis

The articles were published in 72 different journals. As shown in Figure 2, the number of the articles' citations had suffered an increase in 2009, reaching a peak in 2019 with a total of 200 citations. As shown in Table 1, the articles published in journals indexed in the *SCI* (n = 75) received a total of 1,252 citations and those found in Google Scholar (n = 152) received 3,105 citations, of which 744 (24 %) corresponded to journals not indexed in *SCI*. According to the *SCI*, the highest ratio of citations per article corresponded to articles published in English (22.2 citations / article), within the set of cases category (21.1 citations / article), in the field of neurobiology (29.5 citations / article) and specifically *neuroimaging* (52 citations / article). The publications of the Catalonia's *GIU* are those with the greatest impact in the number of citations received (25.7 citations/article), followed by Andalusia (15.2 citations/article) and the Valencian Community (13.5 citations/article).

As shown in Figure 3, the journals whose articles had received the highest number of citations according to the *JCR* were *Archives of Sexual Behavior* (217 citations) *Psychoneuroendocrinology* (207 citations), *Journal of Sexual Medicine* (178 citations) and *Journal of Psychiatric Research* (165 ci-

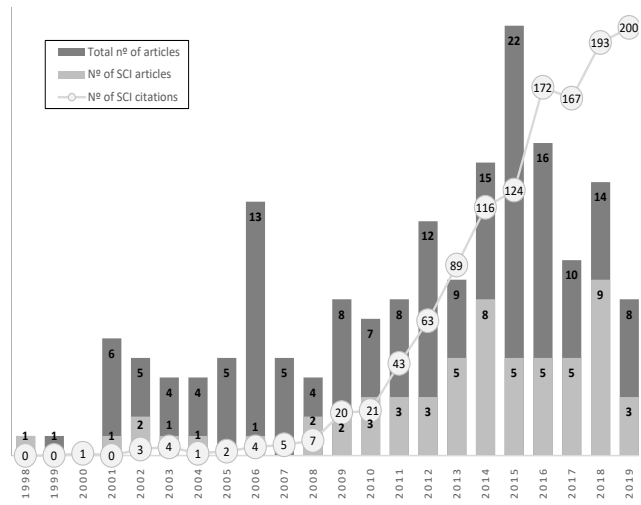


Figure 2

Evolution of Spanish publications related to gender dysphoria generated from the *GIUs*: total number of articles, number of articles published in journals indexed in the *Journal Citation Reports (JCR)* and number of citations collected using the *Science Citation Index (SCI)* from the *Web of Science Core Collection*.

Tabla 1

Bibliometric analysis of Spanish publications on gender dysphoria generated from the *GIUs*, and impact on the number of citations according to the *Science Citation Index (SCI)* of the *Web of Science Core Collection* and *Google Scholar*.

	Total n (%)	n	SCI citations	ratio	Google Scholar n	citations	ratio
	179 (100%)	75	1252	17.2	152	3105	20.7
<b>Language of publication</b>							
Spanish	116 (64.8%)	21	118	5.6	90	935	10.4
English	62 (34.6%)	53	1132	22.2	61	2159	36.6
Portuguese	1 (0.6%)	1	2	2.0	1	11	11.0
<b>Type of studies</b>							
With set of cases	82 (45.8%)	49	996	21.1	76	2082	28.1
Theoretical	60 (33.5%)	9	137	15.2	51	745	14.6
Surgical techniques	10 (5.6%)	6	87	14.5	9	163	18.1
Clinical cases	10 (5.6%)	2	24	12.0	7	77	11.0
Editorials	7 (3.9%)	3	5	1.7	4	32	8.0
Letters and responses	6 (3.4%)	4	3	0.8	3	4	1.3
Qualitatives	3 (1.7%)	1	0	0.0	1	0	0.0
Experimental	1 (0.6%)	1	0	0.0	1	2	2.0

	Total	n	SCI		Google Scholar		
	n (%)		n	citations	ratio	n	citations
<b>Subject of the study</b>							
Psychology and mental health	104 (58.1%)	35	519	14.8	82	1421	17.3
Endocrinology	32 (17.9%)	10	159	15.9	29	478	16.5
Neurobiological bases	17 (9.5%)	17	442	29.5	17	891	59.3
<i>Neuroimaging</i>	8 (4.5%)	8	364	52.0	8	711	101.3
<i>Genetics</i>	9 (5.0%)	9	78	9.8	9	180	22.5
Surgery	12 (6.7%)	8	90	11.3	11	167	15.2
Epidemiology	7 (3.9%)	2	7	3.5	7	74	10.6
Public health	7 (3.9%)	3	33	11.0	6	74	12.3
<b>Gender Identity Units</b>							
Catalonia	46 (25.7%)	37	901	25.7	45	1778	41.3
Madrid	42 (23.5%)	8	49	6.1	37	366	9.9
Andalusia	36 (20.1%)	17	259	15.2	31	705	22.7
Asturias	27 (15.1%)	8	13	1.6	19	101	5.3
Valencia	20 (11.2%)	2	27	13.5	13	134	10.3
Navarra	4 (2.2%)	2	1	0.5	3	7	2.3
Canary Islands	2 (1.1%)	1	0	0.0	2	7	3.5
Basque Country	1 (0.6%)	0	0		1	7	7.0
Castile and León	1 (0.6%)	0	0		1	0	0.0

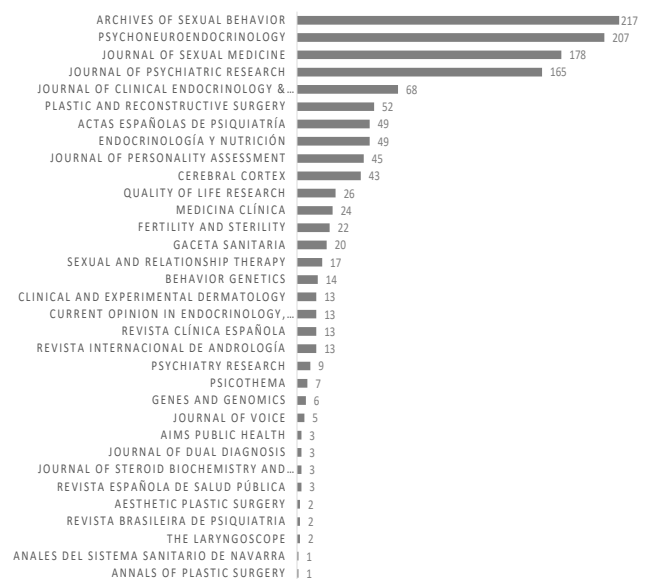
tations). The journals with the greatest impact in the year of publication according to the *JCR* were *Cerebral Cortex* (JIF in 2013: 8,305) and *Journal of Clinical Endocrinology & Metabolism* (JIF in 2008: 6,325), *Neuroimage* (JIF in 2018: 5,812) and *Psychoneuroendocrinology* (JIF in 2010: 5,168). *Cuadernos de Medicina Psicosomática y Psiquiatría de Enlace* (n = 13) and *Endocrinología y Nutrición* (n = 12) are the journals where most of the articles were published.

**b) Contents analysis**

All review's results are presented below to facilitate the search for articles by topic, type of study, and specific content.

**Psychology and Mental Health**

More than half of the studies in the field of mental health are theoretical in the form of non-systematic review articles, opinions, or editorials, and address the following aspects: gender, sex and sexual diversity<sup>8-11</sup>, general aspects on the subject of transsexuality<sup>12-17</sup>, history<sup>1,18</sup>, epistemological reflections<sup>19</sup>, reflections on the healthcare standards of the *WPATH*<sup>20-22</sup>, psychological and multidisciplinary approach in



**Figure 3** Total number of citations of each journal, collected using the *Science Citation Index* (SCI) of the *Web of Science Core Collection*, of the articles on *gender dysphoria of the Spanish GIUs*.

Gender Identity Units<sup>23-32</sup>, comorbid psychopathology<sup>33,34</sup>, gender minority stress<sup>35,36</sup>, couple relationships and sexuality<sup>37</sup>, sexuality and reproduction<sup>38,39</sup>, socio-family and socio-labor repercussions<sup>40, 41</sup>, reflections on diagnostic classifications<sup>42,43</sup>, diagnostic evaluation and its difficulties<sup>32,44-48</sup>, debates on depathologization<sup>49,50</sup>, sexual dimorphism on cognitive functions and the influence of sex hormones<sup>51</sup>, clinical practice guidelines and special care in adolescence and childhood<sup>52-57</sup>, psychological aspects<sup>58</sup>, rapid-onset gender dysphoria<sup>59</sup>, differences between childhood and adolescence<sup>60</sup>, and healthcare for families of minors<sup>61</sup>.

A significant percentage of studies raised their conclusions from set of cases attended in the different *GIUs*. These studies have evaluated various aspects: temperament and character<sup>62</sup>, psychological profile<sup>63,64</sup>, sociodemographic variables and comorbid psychopathology<sup>65-69</sup>, relationship between hormonal treatment and the presence of anxiety, depressive and phobic symptoms<sup>70</sup>, changes in memory<sup>71</sup>, presence of suicidal ideation<sup>72</sup>, dissatisfaction with body image<sup>26,73</sup>, clinical and mental health variables<sup>71,74,75</sup>, psychological follow-up<sup>29</sup>, sexuality<sup>76</sup>, comorbid substance use<sup>77,78</sup>, general quality of life or psychological well-being<sup>79-82</sup>, quality of sexual life<sup>83</sup>, the presence of violence from the partner towards transgender women<sup>84-86</sup>, and difficulties with transsexuals under custody<sup>87</sup>. Different scales and instruments to assess aspects such as anxiety and depression<sup>88</sup>, gender roles<sup>89</sup>, diagnostic variables<sup>90</sup>, sexual aspects<sup>91</sup>, and voice quality<sup>92</sup> have been created, validated, and analyzed. Healthcare of minors<sup>93-95</sup>, characteristics and persistence of dysphoria in adolescents<sup>56</sup>, bullying and adaptive problems<sup>96,97</sup>, and specific clinical practice guidelines for childhood and adolescents have also been established<sup>52</sup>.

Two articles were clinical case-reports tackling the difference between gender nonconformity and gender dysphoria<sup>98, 99</sup>, sexual orientation<sup>100</sup>, family aggregation<sup>101</sup>, or the complexity of some cases<sup>102</sup>. Only four studies used a qualitative methodology<sup>103-106</sup>, two of them with an anthropological perspective<sup>103,104</sup>.

## Endocrinology

Several publications addressed theoretical aspects about hormonal treatment, such as general considerations<sup>107</sup>, clinical practice guidelines<sup>108,109</sup>, a comprehensive approach with a focus on cross-sex hormone treatment<sup>110-113</sup>, new therapeutic perspectives in minors<sup>53,54</sup>, and a position paper on specific care in childhood and adolescence from the *GID-SEEN* working group<sup>114-117</sup>.

Studies that obtained results from their own set of cases such as cross-sectional or cohort studies have focused on the

morbidity associated with hormonal treatment<sup>118</sup>, healthcare of minors<sup>119</sup>, effects of hormonal treatment on the hypothalamic-pituitary axis<sup>120</sup>, on the lipid profile<sup>121</sup>, cardiovascular adverse effects<sup>122,123</sup>, on uric acid<sup>124</sup>, on the mitochondrial involvement and the oxidative stress in leukocytes<sup>125</sup>, and on hormonal receptors<sup>126</sup>. The nutritional status and prevalence of obesity<sup>127</sup>, the evolution of the gonadal axis after sexual reassignment surgery<sup>128</sup>, the prevalence of hyperandrogenism and polycystic ovaries in transsexual men<sup>129</sup>, and the experience with oral finasteride for alopecia in transsexual men<sup>130</sup> have also been addressed.

At the same time, clinical cases of prolactinoma<sup>131</sup> and meningioma tumors<sup>132</sup>, related with cross-sex hormone treatment, as well as deep vein thrombosis in transsexuals<sup>133</sup> have been published.

## Gender-affirming surgery

Most of the studies of gender-affirming surgery focused on feminizing genital surgery, specifically in experience and techniques used in vaginoplasty<sup>134-139</sup>, complications<sup>140, 141</sup> and aesthetic improvement techniques<sup>142</sup>. Only two articles dealt with phalloplasty surgery<sup>143, 144</sup>, and another article referred to surgical voice feminization in male-to-female transsexuals and compared cricothyroid approximation and glottoplasty<sup>145</sup>.

## Neurobiological bases of gender dysphoria

Two extensive reviews have been published that bring together on the biological contributions to gender identity, gender diversity and gender dysphoria<sup>146,147</sup>, and on gender differences of somatostatin-receptor density in the human brain<sup>148</sup>. The rest of the studies, based on set of cases, are focused on neuroimaging and genetics. The *GIU* from Catalonia in collaboration with the *UNED* has described findings based on functional neuroimaging<sup>149</sup>, white matter microstructure<sup>150-152</sup>, cortical thickness<sup>153,154</sup>, and brain network interactions<sup>155</sup> in individuals with gender incongruence. The effects of cross-sex hormone treatment on white matter microstructure and on cortical thickness in transsexual individuals have also been evaluated<sup>152,154</sup>. And the effects of androgenization on brain morphology and metabolomic profile using animal models have been described<sup>156</sup>.

On the other hand, the *Department of Psychobiology of the University of A Coruña*, in collaboration with the *UNED* and the *GIUs* from Andalusia and Catalonia, have published various molecular genetic studies related to karyotype<sup>157</sup>, the association with hormone receptor genes<sup>158-163</sup>, the interactions between androgen and estrogen receptors<sup>164</sup>, as well as

reviews<sup>165</sup> and projects in international cooperation on the genetic bases of gender diversity<sup>146</sup>. The influence of hormone treatment on the methylation and expression of promoter regions of the androgen and estrogen receptor genes<sup>126</sup> and the relationship of some estrogen receptor genotypes and haplotypes with gender dysphoria<sup>161</sup> has also been investigated.

Finally, the set of family cases of gender dysphoria in non-twin siblings in the Andalusian and Catalan units has been published, as well as the birth order and ratio of brothers to sisters in Spanish transsexuals<sup>166, 167</sup>.

### Epidemiology

Three reviews addressed epidemiological and sociodemographic aspects<sup>134,168</sup>. Six *GIUs* analyzed epidemiological data based on the series of subjects who attend these units. Andalusia provided sociodemographic characteristics and initial demand data<sup>31,139,169-171</sup>, accumulated prevalence in ten years<sup>172</sup>, and epidemiology with special attention to childhood and adolescence<sup>173, 174</sup>. Catalonia published an estimation of the prevalence, incidence and sex ratio<sup>175</sup>, provided sociodemographic characteristics in a preliminary set of cases<sup>176</sup> and in the 250 first subjects evaluated<sup>177</sup>, and described the demand of healthcare from 2000 to 2009<sup>172</sup>. Madrid also published data on prevalence, incidence and sex ratio<sup>178</sup>, the experience with the first 236 cases<sup>179</sup>, described the set of cases in minors<sup>94</sup>, and analyzed variables related to the approach, diagnosis and persistence of dysphoria<sup>56</sup>. Asturias described the analysis and evolution of the sociodemographic profile<sup>180-182</sup>, and the characteristics of minors<sup>93,183</sup>. Navarra has published data on general health care demand<sup>184</sup> and focused on the child and adolescent population<sup>95</sup>. And the Basque Country provided data on health care for children and adolescents<sup>119</sup>.

### Public healthcare: Organization of the care for transsexual in the Spanish National Health System

During the first years of healthcare for people with gender dysphoria, two editorials discussed the challenges of the Spanish National Health System<sup>185-187</sup>. In 2012, the organization and coordination of the public health care for transsexual people in Spain was published, as well as the multidisciplinary *GIUs* existent at that time<sup>3,188,189</sup>, subsequently providing information on the multidisciplinary approach and on the demand of health care in the *GIUs*<sup>116</sup>.

### Published books

Six monographic books have been edited or written mostly by professionals from the *GIUs*. Two compendiums,

*Transsexuality, the search for an identity* (2003)<sup>168</sup> and *Being transsexual* (2006)<sup>1</sup>. Two manuals, *An approach to transsexuality from the sex/gender double reality* (2010)<sup>190</sup>, *Evaluation and treatment of transsexuality* (2011)<sup>191</sup>. Another book focused on child population, *Minors and gender identity. Health, legal and bioethical aspects* (2017)<sup>192</sup>. And the most recent, *Health care for transsexuality and identity diversity* (2020)<sup>193</sup>. The contribution in book chapters has not been included in this study.

## DISCUSSION

The biomedical research in the field of gender dysphoria or transsexuality is a field of great and timely interest in the international scientific community. This answers the growing demand for healthcare of these people after years of exclusion and still scarce despite the notable advances made in recent decades both in our country<sup>2</sup> and neighboring countries. Acknowledging the evolution of epidemiology, the sociodemographic, and emotional characteristics of these people, the types of treatments they undergo, and the degree of satisfaction with the therapeutic strategies is essential to offer evidence-based quality of health care. This literature review assesses the state of the art of Spanish research carried out by the *GIUs* for more than 20 years regarding aspects related to the health care of transgender people.

In the bibliometric analysis, the first important result is that the number of Spanish publications, 179, can be considered as high, although it corresponds to a period of slightly more than 20 years, considering that the healthcare for transgender people had been nearly non-existent until the creation of the first *GIU*, and this establishment has been slow, progressive, and not similar in all the autonomous communities<sup>2</sup>. The analysis of its evolution shows that the research productivity on this topic has increased progressively since 1999, the year in which the first unit was created in Andalusia, until 2015, when a maximum of 22 publications per year was reached, and with a slight subsequent decrease. The increase is contemporaneous to the gradual creation of new *GIUs*, the increase in clinical experience, and the possibility of evaluating broader set of cases. In fact, almost half are based on case series analysis, that is, they are epidemiological, observational, and prospective and retrospective longitudinal studies, and therefore based on objective and quantifiable findings. In contrast, the studies published by surgical professionals are still scarce, which is consistent with the scant public coverage of surgical treatments and the absence of this coverage even in many communities. With regard to the origin of the articles, the results are to be expected, since the highest biomedical research is associated with those *GIUs* that started their activity earlier,

Andalusia, Catalonia and Madrid, and those *GIUs* with fewer researches, those of more recent creation.

The most relevant aspect of the bibliometric analysis is the international impact achieved, reflected in the high number of citations and its progressive increase in the last decade, reaching 200 citations in 2019 (Figure 2). It is noteworthy that an article on sociodemographic and clinical aspects exclusively of the Spanish population has been referenced 102 times in journals indexed in the *SCI*<sup>177</sup>, and another on the influence of hormonal treatment in reducing anxiety and depression in transsexual people, has received 95 citations<sup>70</sup>. Several neuroimaging studies have obtained an average of 52 citations per article<sup>150-152</sup>, or have been published in highly relevant journals according to the *JCR* quartile to which it belongs<sup>124,153</sup>. Although the benchmark with other countries are not established as research is constantly increasing, and we lack similar comparison reviews, considering that the 75 most popular online articles in journals indexed in *PubMed* on transgender health have received an average of 63 citations<sup>194</sup>, we could state that a certain leadership has been achieved within international research. In the field of *neuroimaging*, the average number of citations is close to 60. The foundations that have allowed the greatest impulse in research has been the creation of the *GIUs*: multidisciplinary teams with specialized services, and with a growing set of cases, allowing specialists to focus on the advances and changes that increasingly occur in this field, despite the difficulties associated with the fact that Spanish investment in *R&D* has been practically inexistent. Only in the recent years some support has been received in this field, mainly in *neuroimaging* and *genetics*, which has had an impact in achieving leadership.

The studies not indexed in the *SCI* have also received a total of 744 citations obtained in search tools such as *Google Scholar*. This search tool has the advantage that it is freely accessible, includes a wide typology of information sources, and has good coverage for languages other than English. Therefore, the number of referenced citations reflects that these publications also had relevance in the scientific community. Many of the works in the Spanish language, theoretical or based on the clinic, have a marked interest due to their academic function for the general population, for managers, and for health professionals; and moreover, they favor understanding and social tolerance.

The contents analysis showed that these are wide and cover practically all the areas that interplay in health care, leading the research from psychology and mental health. These results support a recent study that finds a predominant research trend in aspects of mental health and social well-being<sup>194</sup>. Epidemiological and sociodemographic data of the Spanish population have been provided, which are

very necessary for health management policies. Clinical guidelines based on international recommendations and positioning documents have been published, also highly useful in clinical practice for professionals involved in this field. However, there are certain shortcomings in terms of subject matter. Studies that address the adverse effects of hormonal treatments, the results of surgical techniques, user's satisfaction, or aspects related to childhood<sup>174</sup> can still be considered scarce. There are also few references on psychotherapy, which may be due to the fact that the variety between the needs of each individual makes it necessary to decide on different therapeutic strategies that do not always include psychotherapy. Only three articles use a qualitative research methodology. The legal and bioethical aspects integrated with the health have been addressed only theoretically<sup>192</sup>. Finally, there are no specific studies on psychosocial adaptation after treatment, cases of detransition, aspects related to the elderly, or studies on gender variants, neither situations of gender non-binarism. The direction of future research points towards such topics also internationally, and the aims are to improve the quality of life of these people<sup>195</sup>.

In accordance with the changes in the nomenclature over the years, the keywords and terminology used in the articles have evolved<sup>196</sup>. For this reason, the terms of transsexualism (ICD-10; 1994), sexual or gender identity disorder (DSM-IV, 1994; DSM-IV-TR, 2000), gender dysphoria (DSM-5, 2013) or gender incongruence (ICD-11; 2018), are used<sup>43</sup>. In the most recent articles, the tendency is to use the broader term, transgender, to cover the entire spectrum of gender variants<sup>5,196</sup>.

As a limitation of the study, the review did not include book chapters, abstracts of communications or posters to congresses, doctoral theses, or biomedical production not associated with the *GIUs*, due to the marked extension of the citations collected. For the same reason, a critical analysis of the content has not been carried out.

There are several strengths of the study. The first, the number of sources consulted and the meticulousness of the methodology, which allows to reflect a complete overview of the *GIUs* scientific production, not only those with the most international impact, but also those published in less relevant journals, but still not lacking interest in the field of the clinical and national concern. The authors are aware that fitting all research into the category of high-impact journals, weakens the scientific knowledge based on reflections and theoretical papers, first research on this topic, and daily clinical aspects, because these articles are also essential to obtain an historical and biopsychosocial perspective. Furthermore, this review refutes the previous bibliographic study that concluded scientific production in the biomedical field as of 2005 was scarce<sup>6</sup>. The second strength is the clas-



sification that is made by topics and specific content of each article. This classification is a source of information that can greatly facilitate the search for specific content; and therefore, serve as guidance to healthcare specialists who are starting their professional career in the subject, to healthcare providers who have addressed healthcare to these people in equity with other users recently, and to present and future researchers, national and international, because it provides an update of all the research of the Spanish *GIUs*. And finally, the third strength is that in the review take part professionals from the units, with more than 20 years of experience in transgender health care, which favors in-depth knowledge of the topic, both clinically and scientific, at the time to perform the analysis.

It is difficult to predict whether this increase in scientific publications will persist in the coming years, at least in the field of transgender health. Although the growing interest in the topic by more professionals could suggest a progressive increase in research, there is a factor that can condition a regression in investigation, at least in the field of health care. This factor is the recent implementation of new healthcare models not based on specialized *GIUs*, but from healthcare in proximity, and with little or no coordination with mental healthcare<sup>197</sup>. This may lead to greater difficulties in conducting cross-sectional (epidemiological, sociodemographic) or longitudinal studies (evolution, side effects of the treatments), by not grouping large set of cases and cohorts that favor this knowledge. In fact, in the last three years a moderate decrease in scientific production has already been reflected (Figure 2).

In sum, scientific production in Spain on the healthcare of gender dysphoric people, generated from the *GIUs* has had a progressive growth, mainly in the last decade. It covers a wide range of topics, includes a large number of studies based on the analysis of set of cases of this population, and the number of citations reflects an impact on the scientific community and international leadership in some areas such as *neuroimaging*.

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## CONFLICTS OF INTEREST

The authors have no conflicts of interest.

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**Annex A. Initial sources of information for the present study**

**Databases:**

- CINAHL complete
- CUIDEN
- Dialnet plus
- IBECs
- InDICES CSIC
- Medes: medicina en español
- Psicodoc
- PsycINFO
- PubMed
- Scopus
- WoS-BIOSIS previews
- WoS-Core Collection
- WoS-CABI: CAB Abstracts
- WoS-Current Contents Connect
- WoS-SciELO Citation Index
- ENFISPO
- LILACS

**Platforms:**

- Ovid-Sumaris i resums
- Sage Journals Online
- ScienceDirect Citations
- Taylor & Francis Online
- Wiley Online Library

**Annex B: Descriptors accepted by thesaurus MeSH, APA and DeCS**

Source	Descriptors
MeSH	Transgender Persons
	Transsexualism
	Gender dysphoria
	Sexual and Gender Disorders
	Sex Reassignment Procedures
APA	Sex Reassignment Surgery
	Transgender
	Transgender (Attitudes Toward)
	Transsexualism
DeCS	Gender Identity Disorder
	Sexual Orientation
	Personas Transgénero
	Transexualismo
	Disforia de Género
	Trastornos Sexuales y de Género
DeCS	Servicios de Salud para las Personas Transgénero
	Procedimientos de Reasignación de Sexo
	Cirugía de Reasignación de Sexo