Table 1. Overview of the EUROCAT registries and the number and prevalence of the VACTERL patients which were included in the study.

Country	Registry	Years covered by registry	Total of live and still-births in the population	VACTERL cases (N)	VACTERL prevalence[a]
Austria	Styria	1985-2012	327,302	7	0.21
Belgium	Antwerp	1989-2015	427,101	25	0.59
Croatia	Zagreb	1983-2015	206,837	3	0.15
France	Auvergne	2002-2014	149,305	12	0.80
	Brittany	2011-2015	179,180	15	0.84
	French West Indies	2009-2015	68,665	1	0.15
	Ile de la Reunion	2001-2015	218,584	4	0.18
	Paris	1981-2015	1,134,068	15	0.13
Germany	Mainz	1990-2014	85,315	10	1.17
	Saxony Anhalt	1980-2015	543,762	32	0.59
Ireland	Cork and Kerry	1996-2015	179,563	9	0.50
	South East Ireland	2005-2014	74,527	1	0.13
Italy	Emilia Romagna	1981-2015	1,022,236	10	0.10
	Tuscany	1980-2015	770,279	3	0.04
Malta	Malta	1986-2015	137,337	4	0.29
The Netherlands	Northern Netherlands	1981-2015	577,868	50	0.87
Norway	Norway	1999-2012	836,535	3	0.04
Poland	Wielkopolska	1999-2015	626,876	2	0.03
Portugal	South Portugal	1990-2015	408,832	3	0.07
Spain	Basque Country	1990-2014	458,334	12	0.26
	Valencia Region	2007-2015	446,903	13	0.29
Switzerland	Vaud	1989-2015	207,593	15	0.72
Ukraine	OMNI-Net	2005-2015	333,189	4	0.12
UK	East Midlands and South Yorkshire	1998-2012	998,655	13	0.13
	Northern England	2000-2015	512,608	30	0.59
	South West England	2005-2015	545,302	19	0.35
	Thames Valley	1991-2015	411,928	19	0.46
	Wales	1998-2015	602,776	40	0.66
	Wessex	1994-2015	615,000	23	0.37
Total	**29 registries**	**1980-2015**	**13,106,460**	**397**	**0.30**

[a] Rate of live births, stillbirths, and terminations of pregnancy for fetal anomaly following prenatal diagnosis present in this study, per 10,000 births.

Table 2. Specification of the anomalies commonly associated with VACTERL (based on the *ICD*10 coding for congenital anomalies).

VACTERL component feature	Major VACTERL features (including ICD10 codes)	Minor VACTERL features (including ICD10 codes)
Vertebral	• Congenital scoliosis due to congenital bony malformation (Q763), including hemivertebrae, fusion, or failure of segmentation with scoliosis • Other congenital malformations of spine, not associated with scoliosis (Q7640 Q7642), including congenital absence or fusion of spine, hemivertebrae, malformation of spine, and supernumerary vertebrae (*specified in the non-sacral region)* • Combination of unspecified vertebral anomalies with rib anomalies (Q765 or Q766)	• Klippel Feil (Q761) • Scoliosis without specification: 'due to bony malformation' (Q675) • Other congenital malformations of spine, not associated with scoliosis (Q7641), including congenital absence or fusion of spine, hemivertebrae, malformation of spine, and supernumerary vertebrae (*unspecified or specified in the sacral spine)* • Other congenital malformations of spine, not associated with scoliosis (Q764), including kyphosis, lordosis, malformation of lumbosacral (joint) region, platyspondyly • Cervical rib and other congenital anomalies of ribs (Q765, Q766), including accessory rib, congenital absence, cervical rib, fusion or malformation of ribs
Anorectal	• Congenital absence, atresia and stenosis of rectum with or without fistula (Q420, Q421) • Congenital absence, atresia and stenosis of anus with or without fistula (Q422, Q423), including congenital fistula of rectum and anus (Q436), congenital rectovaginal fistula (Q522), and congenital urethra-rectal fistula (Q6474) • Ectopic anus (Q435)	• Persistent cloaca (Q437) • Cloacal exstrophy (Q641)
Cardiac	• Congenital malformations of the cardiac chambers and connections (Q20), **excluding** isomerism of atrial appendages (Q206) • Congenital malformations of cardiac septa (Q21) • Congenital malformations of great arteries, including patent ductus arteriosus (only registered if GA≥37 weeks) and anomalies affecting the aorta (Q250 – Q254)	• Isomerism of atrial appendages (Q206) • Congenital malformations of valves (Q22, Q23) • Other congenital malformations of the heart (Q24) • Congenital malformations of the great arteries affecting the pulmonary artery, other and unspecified great arteries (Q255 – Q259) • Congenital malformations of great veins (Q26)
Tracheal-Esophageal	• Esophageal atresia without fistula (Q390) • Esophageal atresia with tracheo-esophageal fistula (Q391), including broncho-esophageal fistula • Congenital tracheo-esophageal fistula	

	without atresia (Q392)	
Renal	• Renal agenesis and other reduction defects of kidney (Q60) • Renal dysplasia (Q614) • Lobulated, fused and horseshoe kidney (Q631)	• Polycystic kidneys (Q611, Q612, Q613), medullary cystic kidney, other cystic kidney diseases and unspecified cystic kidney diseases (Q615, Q618, Q619) • Congenital obstructive defects of renal pelvis and congenital malformations of ureter (Q62) • Other congenital malformations of kidney (Q63) **excluding** lobulated, fused and horseshoe kidney (Q631)
(Upper) Limb	• Accessory thumb(s) (Q691) • Congenital absence of hand and finger(s), thumb affected (Q7131), or Q713 with describing thumb defects in text • Longitudinal reduction defect of radius (Q714), including clubhand • Other reduction defects of upper limb(s) (Q718) with text information describing thumb defects • Other congenital malformations of upper limb(s) (Q74) with text information describing thumb defects	• Congenital deformity of finger(s) and hand (Q681) • Accessory finger(s) (Q690) • Fused fingers (Q700), webbed fingers (Q701), and polysyndactyly (Q704) • Congenital absence of (parts of) upper limbs (Q710-712), longitudinal reduction defects of ulna (Q715), lobster-claw hand (Q716), other and unspecified reduction defects of upper limbs (Q718-Q719), or Q713 without describing thumb defects in text • Other congenital malformations of upper limb(s) (Q740)

GA, gestational age. The rationale for the division into major and minor VACTERL features is provided in the Supplemental information.

Table 3. Characteristics of VACTERL patients among the total group of patients and in the VACTERL subtypes.

	Total group of VACTERL patients (N=397, 100%)[a] N (%)	STRICT-VACTERL (N=213, 54%)[a] N (%)	VACTERL-LIKE (N=82, 20%)[a] N (%)	VACTERL-PLUS (N=102, 26%)[a] N (%)
Gender				
Male	256 (65.1)	133 (62.7)	53 (65.4)	70 (70.0)
Female	137 (34.9)	79 (37.3)	28 (34.6)	30 (30.0)
Year of birth or TOPFA				
1980-1989	22 (5.5)	11 (5.2)	4 (4.9)	7 (6.9)
1990-1999	72 (18.1)	38 (17.8)	16 (19.5)	18 (17.6)
2000-2009	166 (41.8)	85 (39.9)	39 (47.6)	42 (41.2)
2010-2015	137 (34.5)	79 (37.1)	23 (28.0)	35 (34.5)
Type of birth				
Live birth	301 (75.8)	156 (73.2)	75 (91.5)	70 (68.6)
Stillbirth	13 (3.3)	7 (3.3)	1 (1.2)	5 (4.9)
TOPFA	83 (20.9)	50 (23.5)	6 (7.3)	27 (26.5)
Survival (> 1week postpartum)[b]	256 (87.4)	135 (88.2)	69 (95.8)	52 (76.5)
Preterm birth (<37 weeks)[b]	128 (44.0)	62 (41.3)	30 (41.7)	36 (52.2)
Low birth weight (<2500 gram)[b]	151 (51.2)	72 (47.4)	40 (54.1)	39 (56.5)
Twin pregnancy	22 (5.6)	13 (6.1)	5 (6.1)	4 (4.0)
Maternal age at birth (≥35 years)	68 (17.9)	39 (19.0)	8 (10.1)	21 (21.9)

TOPFA = termination of pregnancy for fetal anomaly; *Among live births only;

[a] Numbers do not add up to total number due to missing values: gender 1% , birth year 0%, birth type 0%, survival 3%, preterm birth 3%, low birth weight 2%, twin pregnancy 0.3%, and maternal age at birth 4%.

[b] Only calculated for live births.

Table 4. Absolute numbers and percentages (%) of VACTERL component features and additional congenital anomalies among the total group of VACTERL patients and in the VACTERL subtypes.

	Total group of VACTERL patients (N=397)	STRICT-VACTERL (N=213)	VACTERL-LIKE (N=82)	VACTERL-PLUS (N=102)
VACTERL component feature				
Vertebral				
Major	131 (33.0)	95 (44.6)	6 (7.3)	30 (29.4)
Minor	130 (32.7)	42 (19.7)	47 (57.3)	41 (40.2)
Total	261 (65.7)	137 (64.3)	53 (64.6)	71 (69.6)
Anorectal				
Major	247 (62.2)	148 (69.5)	41 (50.0)	58 (56.9)
Minor	12 (3.0)	2 (0.9)	6 (7.3)	4 (3.9)
Total	259 (65.2)	150 (70.4)	47 (57.3)	62 (60.8)
Cardiac				
Major	227 (57.2)	144 (67.6)	29 (35.4)	54 (52.9)
Minor	26 (6.5)	7 (3.3)	8 (9.8)	11 (10.8)
Total	253 (63.7)	151 (70.9)	37 (45.1)	65 (63.7)
Tracheo-Esophageal				
Major	247 (62.2)	144 (67.6)	53 (64.6)	50 (49.0)
Renal				
Major	202 (50.9)	122 (57.3)	21 (25.6)	59 (57.8)
Minor	65 (16.4)	28 (13.1)	23 (28.0)	14 (13.7)
Total	267 (67.3)	150 (70.4)	44 (53.7)	73 (71.6)
Limb				
Major	98 (24.7)	63 (29.6)	9 (11.0)	26 (25.5)
Minor	27 (6.8)	9 (4.2)	12 (14.6)	6 (5.9)
Total	125 (31.5)	72 (33.8)	21 (25.6)	32 (31.4)
Additional congenital anomalies[a]				
Congenital anomalies outside the VACTERL spectrum	102 (25.7)	-	-	102 (100)
Tethered cord	9 (2.3)	4 (1.9)	3 (3.7)	2 (2.0)
Respiratory system anomalies	45 (11.3)	19 (8.9)	6 (7.3)	20 (19.6)
Genitourinary anomalies	63 (15.9)	38 (17.8)	9 (11.0)	16 (15.7)
Hip anomalies	6 (1.5)	3 (1.4)	1 (1.2)	2 (2.0)
Lower limb anomalies	50 (12.6)	26 (12.2)	8 (9.8)	16 (15.7)

[a] All additional congenital anomalies were listed as major congenital anomalies outside the VACTERL spectrum, with five exceptions: tethered cord, respiratory system anomalies, genitourinary anomalies, hip anomalies, and lower limb anomalies.

Table 5. Distribution of the different congenital anomalies according to the current study and the literature.

Component feature	Major features (Total group of VACTERL patients, N=397) N (%)	Major features (STRICT-VACTERL, N=213) N (%)	Major and minor features (Total group of VACTERL patients, N=397) N (%)	Major and minor features (STRICT-VACTERL, N=213) N (%)	Husain et al. (2018) (N=36) N (%)	Solomon et al. (2010) (N=60) N (%)	Botto et al. (1997) (N=286) N (%)	Khoury et al. (1983) (N=50) N (%)
V	131 (33%)	95 (45%)	261 (66%)	137 (64%)	29 (81%)	47 (78%)	190 (66%)	18 (36%)
A	247 (62%)	148 (70%)	259 (65%)	150 (70%)	22 (61%)	33 (55%)	236 (83%)	20 (40%)
C	227 (57%)	144 (68%)	253 (64%)	151 (71%)	30 (83%)	48 (80%)	136 (48%)	40 (80%)
TE	247 (62%)	144 (68%)	247 (62%)	144 (68%)	25 (69%)	31 (52%)	168 (59%)	12 (24%)
R	202 (51%)	122 (57%)	267 (67%)	150 (70%)	22 (61%)	43 (72%)	231 (81%)	41 (82%)
L	98 (25%)	63 (30%)	125 (32%)	72 (34%)	18 (50%)	28 (47%)	111 (39%)[a]	34 (68%)

V = vertebral anomalies, A = anorectal anomalies, C = cardiac anomalies, TE = Tracheo-esophageal anomalies, R = renal anomalies, L = limb anomalies; NS = not shown.

[a] N=100 (35%) of the limb anomalies were pre-axial.