

Table 1. General characteristics of children with SA according to allergy status.

Characteristics	SA	Allergic SA	Non allergic SA	P
n	48	39	9	
Gender				
Male/female	30/18	25	5	0.65
Age (years)	13.4 [10.73 - 16.18]	14.30 [11.00 - 16.40]	11.30 [8.75 - 13.75]	0.03
BMI (kg/m2)	19.37 [17.14 - 21.91]	19.95 [17.12 - 22.32]	18.08 [16.94 - 19.60]	0.16
Comorbid diseases				
Atopic dermatitis	15 (31.2%)	15 (38.5%)	0 (0)	0.02
Food allergy	8 (16.6%)	8 (20.5%)	0 (0)	0.14
Allergic rhinitis+/-conjunctivitis	37 (77%)	37 (95%)	0 (0)	< 0.01
Nasal polyps	1 (2.1%)	1 (2.5%)	0 (0)	0.67
Sinusitis	3 (6.3%)	3 (7.7%)	0 (0)	0.41
Gastroesophageal reflux disease	14 (29.1%)	13 (33.3%)	1 (11.1%)	0.19
Obstructive sleep apnea syndrome	1 (2.1%)	1 (2.5%)	0 (0)	0.67
1 allergic comorbidity	24 (50%)	24 (61.5%)		
2 allergic comorbidities	11 (22.9%)	11 (28.2%)		
3 allergic comorbidities	4 (8.3%)	4 (10.3%)		
Influenza vaccination, n (%)	21 (43.7%)	18 (46.1%)	3 (33.3%)	0.49
Utilization of treatments				
Dose of ICS (µg/d flu eq.)	500 [500-500]	500 [500-500]	500 [450-500]	0.54
LABA, n (%)	42 (87.5%)	34 (87.1%)	8 (88.8%)	0.91
Nebulization for maintenance treatment, n (%)	7 (14.6%)	5 (12.8%)	2 (22.2%)	0.49
Leukotriene antagonist, n (%)	26 (54.1%)	20 (51.3%)	6 (66.6%)	0.41
Long term antibiotic treatment, n (%)	3 (6.3%)	2 (5.1%)	1 (11.1%)	0.53
Anti-Ig E, n (%)	22 (45.8%)	21 (53.8%)	1 (11.1%)	0.02
Allergen Immunotherapy, n (%)	1 (2.1%)	1 (2.5%)	0 (0)	0.66
Rehabilitation, n (%)	2 (4.2%)	1 (2.5%)	1 (11.1%)	0.27
Patients having outpatient clinical and laboratory				

tests, n (%)				
Spirometry	35 (72.9%)	28 (71.8%)	7 (77.7%)	0.73
At hospital	35 (72.9%)	28 (71.8%)	7 (77.7%)	0.73
In ambulatory	1 (2.1%)	1 (2.5%)	0 (0)	0.67
skin test for allergy	12 (25%)	10 (25.6%)	2 (22.2%)	0.85
blood test for allergy-specific IgE	15 (31.2%)	13 (33.3%)	2 (22.2%)	0.53
chest X-ray	6 (12.5%)	5 (12.8%)	1 (11.1%)	0.90
ENT endoscopy	4 (8.4%)	4 (10.2%)	0 (0)	0.33
pHmetry	2 (4.2%)	2 (5.1%)	0 (0)	0.51
Emergency department visit, n (%)	11 (22.9%)	10 (25.6%)	1 (11.1%)	0.36
Emergency department visit per patient	0.81 (39/48)	0.95 (37/39)	0.22 (2/9)	
Day Care Unit admission, n (%)	3 (6.3%)	3 (7.7%)	0 (0)	0.41
Hospitalization, n (%)	4 (8.4%)	3 (7.7%)	1 (11.1%)	0.76
in emergency unit	2 (4.2%)	1 (2.5%)	1 (11.1%)	0.27
in pulmonology unit	2 (4.2%)	2 (5.1%)	0 (0)	0.51
Urgent (unscheduled) physician visit in ambulatory, n (%)	21 (43.7%)	18 (46.1%)	3 (33.3%)	0.49
Scheduled physician visit, n (%)				
Hospital outpatient visit				
To pulmonologist/allergist	43 (89.6%)	34 (87.1)	9 (100%)	0.27
To ENT specialist	4 (8.4%)	4 (10.2%)	0 (0)	0.33
To dermatologist	2 (4.2%)	2 (5.1%)	0 (0)	0.51
To ophtalmologist	1 (2.1%)	1 (2.5%)	0 (0)	0.67
Ambulatory visit				
To general practitioner	6 (12.5%)	4 (10.2%)	2 (22.2%)	0.34
To pediatrician	4 (8.4%)	3 (7.7%)	1 (11.1%)	0.76
To pulmonologist	4 (8.4%)	4 (10.2%)	0 (0)	0.33
To allergist	1 (2.1%)	1 (2.5%)	0 (0)	0.67
To ENT specialist	5 (10.4%)	4 (10.2%)	1 (11.1%)	0.96
To dermatologist	0 (0)	0 (0)	0 (0)	

To ophtalmologist	1 (2.1%)	1 (2.5%)	0 (0)	0.67
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SA: severe asthma, NSA: non-severe asthma, BMI: body mass index, ICS: inhaled corticosteroids, µg/d flu eq: µg/day in fluticasone equivalent, LABA: long-acting beta-2 agonist, ENT: ear nose throat

Table 2. Estimated costs (€) for children with SA according to allergy status during the six-month study period

Direct costs	Allergic SA (n = 39)			Non allergic SA (n = 9)			p*
	Mean (SD)	Median [25% -75%]	95% CI	Mean (SD)	Median [25% -75%]	95% CI	
Medications :	2,967 (3,742)	1,176 [257.90 -5,211]	1,754; 4,180	433.00 (487.10)	278.80 [165.20-482.00]	58.59; 807.40	0.06
Asthma Rescue treatment							
SABA (MDI or DPI)	22.76 (19.20)	16.15 [8.07-32.29]	16.53; 28.98	7.67 (2.61)	8.07 [5.73-9.94]	5.664; 9.669	< 0.01
SABA (nebulizer solution)	18.66 (58.13)	0 [0-11.56]	- 0.1807; 37.50	8.09 (13.10)	0 [0-19.07]	- 1.98; 18.16	0.91
Ipratropium bromide in nebulizer solution	4.65 (16.86)	0 [0-0]	- 0.8111; 10.12	6.14 (18.41)	0 [0-0]	- 8.016; 20.29	0.83
Oral corticosteroids	5.48 (5.09)	4.810 [2.40-7.22]	3.803; 7.147	2.94 (1.60)	2.41 [2.41-4.81]	1.7107; 4.172	0.23
Asthma Maintenance treatment							
Inhaled corticosteroid (±LABA) treatment (MDI, DPI)	127.50 (69.32)	141.40 [99.48-149.20]	105.0; 150.0	111.70 (56.27)	141.40 [61.56-150.20]	68.47; 155.0	0.89
Inhaled corticosteroid (nebulizer solution)	34.40 (89.36)	0 [0-0]	5.436; 63.37	42.76 (104.60)	0 [0-34.98]	- 37.66; 123.2	0.93
Leukotriene modifiers	42.27 (44.37)	29.71 [0-89.12]	27.89; 56.65	62.71 (47.42)	89.12 [0-96.54]	26.26; 99.16	0.17
Long-term antibiotic treatment	2.13 (10.26)	0 [0-0]	- 1.200; 5.451	4.64 (13.91)	0 [0-0]	- 6.055; 15.33	0.53
Anti-Ig E	2,640 (3,683)	716.80 [0-4,603]	1,447; 3,834	156.40 (469.30)	0 [0-0]	- 204.30; 517.20	0.02
Immunotherapy	11.52 (71.92)	0 [0-0]	- 11.80; 34.93	0 (0)	0 [0-0]	0; 0	0.67
Influenza vaccination	4.76 (5.11)	0 [0-10.11]	3.011; 6.321	3.37 (5.06)	0 [0-10.11]	- 0.516; 7.256	0.50
Medical devices ^a	58.87 (91.65)	8.84 [0-86.42]	29.16; 88.58	0 (0)	0 [0-0]	0; 0	< 0.01
Urgent (unscheduled) physician visit in	39.74 (73.61)	0 [0-75]	15.88; 63.60	22.22 (34.11)	0 [0-62.50]	- 3.994; 48.44	0.49

ambulatory

Scheduled physician visits	82.67 (55.52)	75 [28-112]	63.70; 101.60	64.89 (43.92)	28 [28-112]	31.13; 98.65	0.41
Hospital outpatient visits	58.00 (44.69)	56 [28-84]	43.51; 72.49	43.33 (23.40)	28 [28-69]	25.34; 61.32	0.48
To pulmonologist/allergist	52.26 (42.20)	28 [28-84]	38.58; 65.94	43.33 (23.40)	28 [28-69]	25.34; 61.32	0.76
To ENT specialist	2.87 (8.61)	0 [0-0]	0.08209; 5.662	0 (0)	0 [0-0]	0; 0	0.33
To dermatologist	1.44 (6.26)	0 [0-0]	- 0.5923; 3.464	0 (0)	0 [0-0]	0; 0	0.52
To ophtalmologist	0.72 (4.48)	0 [0-0]	- 0.7355; 2.171	0 (0)	0 [0-0]	0; 0	0.67
Ambulatory visits	24.67 (43.17)	0 [0-48]	10.67; 38.66	21.56 (28.48)	0 [0-47]	- 0.335; 43.45	0.84
To general practitioner	7.05 (26.87)	0 [0-0]	- 1.659; 15.76	11.11 (25.34)	0 [0-12.50]	- 8.371; 30.59	0.36
To pediatrician	4.72 (19.87)	0 [0-0]	- 1.723; 11.16	5.11 (15.33)	0 [0-0]	- 6.675; 16.90	0.76
To pulmonologist	5.51 (16.83)	0 [0-0]	0.05611; 10.97	0 (0)	0 [0-0]	0; 0	0.33
To allergist	0.03 (0.16)	0 [0-0]	- 0.02627; 0.07755	0 (0)	0 [0-0]	0; 0	0.67
To ENT specialist	4.92 (14.75)	0 [0-0]	0.1407; 9.705	5.33 (16.00)	0 [0-0]	- 6.965; 17.63	0.96
To dermatologist	0 (0)	0 [0-0]	0; 0	0 (0)	0 [0-0]	0; 0	
To ophtalmologist	1.23 (7.69)	0 [0-0]	- 1.261; 3.722	0 (0)	0 [0-0]	0; 0	0.67
Outpatient Clinical and Laboratory tests	119.90 (99.11)	126.60 [63.32-175.20]	87.74; 152.0	93.74 (83.35)	63.32 [42.30-133.60]	29.67; 157.80	0.50
spirometry	73.06 (60.84)	63.32 [0-126.60]	53.34; 92.78	63.32 (54.84)	63.32 [31.66-63.32]	21.17; 105.50	0.65
skin test for allergy	7.39 (14.35)	0 [0-0]	2.73; 12.04	9.60 (14.40)	0 [0-28.80]	- 1.469; 20.67	0.57
blood test for allergy-specific IgE	27.68 (39.65)	0 [0-83.03]	14.82; 40.53	18.45 (36.61)	0 [0-41.52]	- 9.692; 46.59	0.53
chest X-rays	4.36 (13.08)	0 [0-0]	0.1248; 8.605	2.364 (7.093)	0 [0-0]	- 3,088; 7.817	0.87
ENT endoscopy	2.95 (8.85)	0 [0-0]	0.08443; 5.823	0 (0)	0 [0-0]	0; 0	0.33
pHmetry	4.43 (19.31)	0 [0-0]	- 1.828; 10.69	0 (0)	0 [0-0]	0; 0	0.52
Day care unit admissions	126.20 (464.10)	0 [0-0]	- 24.28; 276.6	0 (0)	0 [0-0]	0; 0	0.41
Emergency department visits	621.40 (1,502)	0 [0-655.00]	134.40; 1,108	145.60 (436.70)	0 [0-0]	- 190.10; 481.20	0.34
Hospitalizations	199.80 (533.70)	0 [0-0]	26.74; 372.80	57.94 (173.80)	0 [0-0]	- 75.67; 191.50	0.68
in emergency unit	13.37 (83.50)	0 [0-0]	- 13.70; 40.44	57.94 (173.80)	0 [0-0]	- 75.67; 191.50	0.27
in pulmonology unit	60.21 (288.40)	0 [0-0]	- 33.28; 153.70	0 (0)	0 [0-0]	0; 0	0.52

Rehabilitation	387.7 (2,421)	0 [0-0]	- 397.20; 1,173	158.20 (474.70)	0 [0-0]	- 206.60; 523.10	0.29
Total	4,477 (4,553)	3,095 [636.80-6,546]	3,001; 5,953	975.60 (1,222)	382.40 [270.9-1,569]	36.29; 1,915	0.01
Indirect costs							
<i>Asthma-related School loss (days)</i>	13.87 (23.26)	5 [2-15]	6.332; 21.41	3.67 (3.12)	2 [1.5-5.5]	1.267; 6.067	0.29
Asthma-related work loss of the father (€)	94.87 (208.60)	0 [0-148.0]	27.26; 162.50	44.11 (83.65)	0 [0-74]	- 23.19; 105.4	0.56
<i>Asthma-related work loss of the father (days)</i>	1.28 (2.82)	0 [0-2]	0.3684; 2.196	0.56 (1.13)	0 [0-1]	- 0.3133; 1.424	0.56
Asthma-related work loss of the mother (€)	74.0 (124.80)	0 [0-148.8]	33.56; 114.40	90.44 (172.7)	0 [0-148]	- 42.28; 223.2	0.99
<i>Asthma-related work loss of the mother (days)</i>	1.00 (1.69)	0 [0-2]	0.4535; 1.546	1.22 (2.33)	0 [0-2]	- 0.5713 ; 3.016	0.99
Total	168.90 (288.10)	0 [0-222]	75.49; 262.30	131.60 (250.30)	0 [0-222]	- 60.87; 324.00	0.52
Global Costs = Direct + Indirect costs	4,646 (4,635)	3,095 [858.8 -6,573]	3,143; 6,149	1,107 (1173)	689.80 [316-1,653]	205.80; 2,008	0.02

SA: severe asthma, DPI: dry powder inhaler, MDI: metered dose inhaler, SABA: short-acting beta-2 agonist, LABA: long-acting beta-2 agonist, ° inhalation chamber, peak flow meter and nebulizer, ENT: ear nose throat.

* Mann Whitney U

Table 3. General characteristics and estimated costs (€) for children with NSA according to allergy status during the six-month study period

	Allergic NSA			Non allergic NSA			p *
Characteristics							
n	14			12			
Comorbid diseases							
Atopic dermatitis	5 (35.7%)			0 (0)			
Food allergy	3 (21.4%)			0 (0)			
Allergic rhinitis+/-conjunctivitis	13 (92.8%)			0 (0)			
1 allergic comorbidity	8 (57.1%)						
2 allergic comorbidities	5 (35.7%)						
3 allergic comorbidities	1 (7.1%)						
Direct costs	Mean (SD)	Median [25% -75%]	95% CI	Mean (SD)	Median [25% -75%]	95% CI	
Medications	160.20 (194.80)	107.20	47.73; 272.60	88.13 (79.36)	71.82	37.71; 138.60	0.49
Asthma Rescue treatment							
SABA (MDI or DPI)	6.93 (4.70)	5.38 [2.69-0.76]	4.215; 9.643	5.93 (3.10)	5.38 [2.69-8.85]	3.960; 7.898	0.79
SABA (nebulizer solution)	0.83 (3.09)	0 [0-11.56]	- 0.957; 2.609	0 (0)	0 [0-0]	0; 0	0.37
Ipratropium bromide in nebulizer	0 (0)	0 [0-0]	0; 0	0 (0)	0 [0-0]	0; 0	< 0.01
Oral corticosteroids	2.01 (2.81)	0.81	0.3845; 3.627	1.40 (1.61)	1.20	0.381; 2.425	0.87
Asthma Maintenance treatment							
Inhaled corticosteroid (± LABA) treatment (MDI, DPI)	67.26 (63.40)	54.43 [14.54-103.7]	30.65; 103.9	60.54 (51.27)	58.17 [7.46-116.3]	27.97; 93.12	0.92
Inhaled corticosteroid (nebulizer solution)	0 (0)	0 [0-0]	0; 0	0 (0)	0 [0-0]	0; 0	< 0.01
Leukotriene modifiers	0 (0)	0 [0-0]	0; 0	16.09 (37.71)	0 [0-0]	-7.87; 40.05	0.13
Long-term antibiotic treatment	0 (0)	0 [0-0]	0; 0	0 (0)	0 [0-0]	0; 0	< 0.01

Immunotherapy	59.85 (139.90)	0 [0-21.32]	- 20.90; 140.60	0 (0)	0 [0-0]	0; 0	0.054
Influenza vaccination	4.33 (5.19)	0 [0-10.11]	1.135; 6.321	2.53 (4.57)	0 [0-7.58]	-0.3776; 5.433	0.37
Medical devices ^a	1.89 (3.76)	0 [0-2.21]	-0.279; 4.068	2.21 (3.99)	0 [0-6.63]	-0.330; 4.750	0.86
Urgent (unscheduled) physician visit in ambulatory	0 (0)	0 [0-0]	0; 0	4.17 (9.73)	0 [0-0]	-2.016; 10.35	0.13
Scheduled physician visits	52.00 (40.76)	50.50 [21-76.5]	28.46; 75.54	29.42 (17.89)	28 [25.75-43]	18.05; 40.78	0.14
Hospital outpatient visits	27.86 (33.98)	28 [0-28]	8.238; 47.48	23.33 (20.10)	28 [0-28]	10.56; 36.10	0.98
To pulmonologist/allergist	25.86 (28.14)	28 [0-28]	9.607; 42.11	23.33 (20.10)	28 [0-28]	10.56; 36.10	0.98
To ENT specialist	0 (0)	0 [0-0]	0; 0	0 (0)	0 [0-0]	0; 0	< 0.01
To dermatologist	2.00 (7.48)	0 [0-0]	- 2.321; 6.321	0 (0)	0 [0-0]	0; 0	0.39
To ophtalmologist	0 (0)	0 [0-0]	0; 0	0 (0)	0 [0-0]	0; 0	<0.01
Ambulatory visits	24.14 (26.63)	12.5 [0-48]	8.765; 39.52	6.08 (15.03)	0 [0-0]	- 3.466; 15.63	0.059
To general practitioner	5.36 (14.47)	0 [0-0]	- 3.00; 13.71	2.08 (7.22)	0 [0-0]	- 2.502; 6.669	0.64
To pediatrician	0 (0)	0 [0-0]	0; 0	0 (0)	0 [0-0]	0; 0	< 0.01
To another specialist	18.79 (16.83)	0 [0-48]	3.329; 34.24	4 (13.86)	0 [0-0]	-4.804; 12.80	0.11
Outpatient Clinical and Laboratory tests	54.46 (64.75)	46.06 [0-92.12]	17.07; 91.84	55.17 (43.11)	63.32 [7.20-63.32]	27.78; 82.56	0.75
spirometry	36.18 (40.92)	31.66 [0-63.32]	12.56; 59.81	52.77 (45.45)	63.32 [0-63.32]	23.89; 81.64	0.35
skin test for allergy	0 (0)	0 [0-0]	0; 0	12.34 (14.79)	0 [0-28.80]	3.803; 20.88	0.01
blood test for allergy-specific IgE	5.93 (22.19)	0 [0-0]	-6.88; 18.74	0 (0)	0 [0-0]	0; 0	0.39
chest X-rays	0 (0)	0 [0-0]	0; 0	0 (0)	0 [0-0]	0; 0	<0.01
ENT endoscopy	0 (0)	0 [0-0]	0; 0	0 (0)	0 [0-0]	0; 0	<0.01
pHmetry	0 (0)	0 [0-0]	0; 0	0 (0)	0 [0-0]	0; 0	<0.01
Day care unit admissions	0 (0)	0 [0-0]	0; 0	0 (0)	0 [0-0]	0; 0	<0.01
Emergency department visits	0 (0)	0 [0-0]	0; 0	109.20 (378.20)	0 [0-0]	- 131.10; 349.40	0.32
Hospitalizations	0 (0)	0 [0-0]	0; 0	37.27 (139.40)	0 [0-0]	- 43.22; 117.7	0.39
in emergency unit	0 (0)	0 [0-0]	0; 0	37.27 (139.40)	0 [0-0]	- 43.22; 117.7	0.39
in pulmonology unit	0 (0)	0 [0-0]	0; 0	0 (0)	0 [0-0]	0; 0	< 0.01
Rehabilitation	0 (0)	0 [0-0]	0; 0	0 (0)	0 [0-0]	0; 0	< 0.01

Total	305.80 (300.50)	217.90 [82.84-457.90]	132.30; 479.30	288.30 (371.50)	190.1 [122.50-287.50]	52.22; 524.30	0.86
Indirect costs							
<i>Asthma-related School loss (days)</i>	1.57 (1.95)	1.50 [0-2.25]	0.446; 2.697	1.96 (2.07)	1.50 [0.63-2.00]	0.642; 3.275	0.61
<i>Asthma-related work loss of the father (€)</i>	31.71 (69.38)	0 [0-18.50]	-8.347; 71.78	18.50 (33.47)	0 [0-55.50]	- 2.764; 39.76	0.97
<i>Asthma-related work loss of the father (days)</i>	0.43 (0.94)	0 [0-0.25]	-0.1128; 0.9699	0.25 (0.45)	0 [0-0.75]	- 0.0374; 0.537	0.97
<i>Asthma-related work loss of the mother (€)</i>	31.71 (55.94)	0 [0-74]	-0.5838; 64.01	49.33 (57.61)	37 [0-74]	12.73; 85.94	0.36
<i>Asthma-related work loss of the mother (days)</i>	0.43 (0.76)	0 [0-1]	-0.008; 0.865	0.67 (0.78)	0.50 [0-1]	0.172 ; 1.161	0.36
Total	305.80 (300.50)	217.90 [82.84-457.90]	132.30; 479.30	288.30 (371.50)	190.10 [122.50-287.50]	52.22; 524.30	0.86
Global Costs = Direct + Indirect costs	369.20 (339.40)	242.80 [110-717.30]	173.20; 565.20	356.10 (382.50)	207.10 [162.40-425]	113.10; 599.10	0.98

NSA: non severe asthma, DPI: dry powder inhaler, MDI: metered dose inhaler, SABA: short-acting beta-2 agonist, LABA: long-acting beta-2 agonist, ^a inhalation chamber, peak flow meter and nebulizer, ENT: ear nose throat.

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