Invasive pneumococcal disease among adults in Germany: impact of infant vaccination and COVID-19 pandemic

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BACKGROUND

Streptococcus pneumoniae remains a leading cause of infectious disease among children and the elderly. In July 2006, vaccination with pneumococcal conjugate vaccine (PCV) was generally recommended in Germany for all children ≤24mo. Apart from a strong direct effect, pneumococcal conjugate vaccination has shown herd protection effects among non-vaccinated children and adults. Since March 2020, the COVID-19 pandemic has strongly deregulated daily life. Here, we present data on invasive pneumococcal disease (IPD) cases among adults ≥16y. in the era of conjugate vaccination during a worldwide pandemic.

MATERIALS

The GNRCS has monitored the epidemiology of IPD in adults in Germany since 1992. All isolates were serotyped using the Neufeld-Quellung-reaction.

RESULTS

Before childhood PCV-vaccination, 40-45% of IPD cases among adults were caused by PCV7-serotypes. After the start of childhood vaccination, this percentage was gradually reduced to 6.3% in 2020-2021 (**Fig1**). Higher-valent vaccines (PCV10, PCV13), introduced among children in 2009, have resulted, among adults, in a reduction of IPD caused by PCV13-serotypes from 59.1% (2010-2011) to 32.4% (2014-2015). However, this percentage remained stable at around 30% in the seasons after (**Fig1**). New PCV formulations currently have a theoretical coverage of 35.9% (PCV15) and 60.0% (PCV20) (**Fig1**).

In 2020-2021, prevalences for IPD among adults, caused by serotypes 3, 4, 19A, 19F were 19.2%, 2.6%, 3.8%, 1.5% respectively, and have been stable the last five seasons. Among non-PCV13 types, 8 (15.7%), 9N (6.2), 22F (4.6%) are most prevalent (**Table1**).

From Jan-Mar 2020, 1019 cases of IPD from adults were received, compared to 1267 (Jan-Mar 2018) and 1092 (Jan-Mar 2019). However, from Apr-Dec 2020, only 817 cases were received, compared to 2022 (Apr-Dec2018) and 1908 (Apr-Dec 2019; **Fig2**). This reduction seems to be due to social distancing measures, and not to decreased reporting, as reported Group B Streptococcus cases showed no effect (**Fig3**).

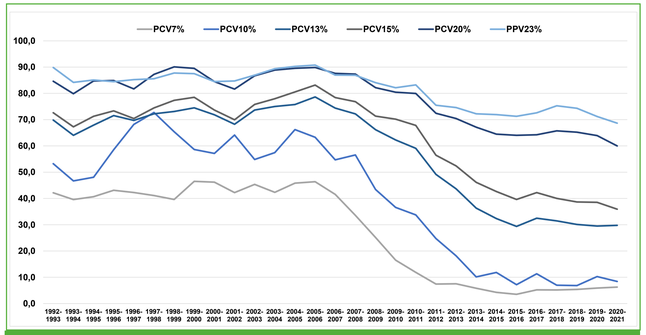

Fig. 1: Coverage of current and future vaccine formulation among adults ≥16 with IPD in Germany

Table 1: Serotype ranking among IPD in adults ≥16 y. in Germany

all	all 1992-2006	%	Serotype	2017-2018	%	Serotype	2018-2019	%	Serotype	2019-2020	%	Serotype	2020-2021	%
total	4468	100,0	total	3107	100,0	total	3184	100,0	total	2390	100,0	total	877	100,0
PPV23	3907	87,4	PPV23	2339	75,3	PPV23	2366	74,3	PPV23	1702	71,2	PPV23	602	68,6
PCV20	3860	86,4	PCV20	2042	65,7	PCV20	2077	65,2	PCV20	1528	63,9	PCV20	526	60,0
PCV15	3379	75,6	PCV15	1244	40,0	PCV15	1231	38,7	PCV15	921	38,5	PCV15	315	35,9
PCV13	3241	72,5	PCV13	978	31,5	PCV13	959	30,1	PCV13	705	29,5	PCV13	261	29,8
PCV10	2584	57,8	PCV10	190	6,1	PCV10	187	5,9	PCV10	148	6,2	PCV10	57	6,5
PCV7	1946	43,6	PCV7	161	5,2	PCV7	171	5,4	PCV7	141	5,9	PCV7	55	6,3
14	591	13,2	3	627	20,2	3	643	20,2	3	447	18,7	3	168	19,2
3	388	8,7	8	374	12,0	8	446	14,0	8	344	14,4	8	138	15,7
4	368	8,2	9N	220	7,1	22F	231	7,3	22F	181	7,6	9N	54	6,2
1	307	6,9	22F	212	6,8	9N	203	6,4	9N	124	5,2	22F	40	4,6
7F	296	6,6	12F	178	5,7	12F	158	5,0	12F	111	4,6	35F	35	4,0
9V	287	6,4	19A	148	4,8	19A	118	3,7	19A	96	4,0	19A	33	3,8
23F	259	5,8	10A	104	3,3	23B	99	3,1	23B	79	3,3	23A	33	3,8
6B	183	4,1	11A	100	3,2	11A	98	3,1	23A	78	3,3	23B	32	3,6
8	160	3,6	23B	94	3,0	10A	91	2,9	4	70	2,9	11A	27	3,1
19F	153	3,4	15A	88	2,8	23A	86	2,7	15A	69	2,9	15A	27	3,1
6A	141	3,2	23A	77	2,5	15A	81	2,5	11A	67	2,8	10A	25	2,9
19A	128	2,9	35F	69	2,2	35F	78	2,4	24F	67	2,8	4	23	2,6
12F	120	2,7	24F	66	2,1	4	67	2,1	10A	59	2,5	16F	23	2,6
9N	118	2,6	6C	58	1,9	24F	62	1,9	35F	48	2,0	24F	19	2,2
18C	105	2,4	38	56	1,8	6C	59	1,9	6C	47	2,0	35B	19	2,2
22F	103	2,3	33F	54	1,7	20	58	1,8	20	37	1,5	33F	14	1,6
11A	99	2,2	20	54	1,7	38	56	1,8	15C	37	1,5	19F	13	1,5
10A	78	1,7	4	50	1,6	16F	54	1,7	33F	35	1,5	20	13	1,5
24F	47	1,1	19F	46	1,5	15B	53	1,7	38	35	1,5	17F	12	1,4
20	38	0,9	16F	45	1,4	35B	45	1,4	16F	34	1,4	6C	12	1,4
5	35	0,8	15B	42	1,4	19F	43	1,4	35B	34	1,4	15C	12	1,4
33F	35	0,8	31	42	1,4	33F	41	1,3	19F	30	1,3	12F	11	1,3
6C	31	0,7	35B	42	1,4	17F	39	1,2	17F	27	1,1	15B	10	1,1
23A	31	0,7	17F	36	1,2	15C	37	1,2	15B	26	1,1	7C	9	1,0

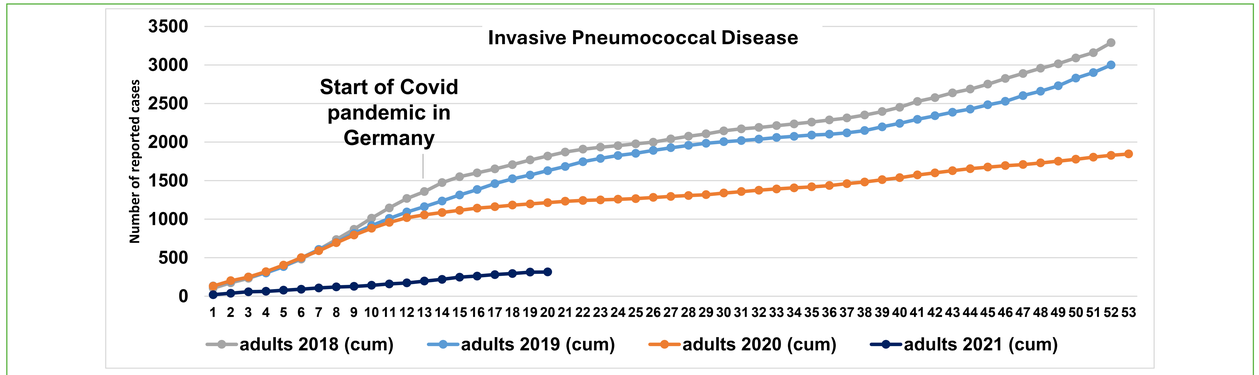

Fig. 2: Number of cases of IPD from adults ≥16 y. in Germany per calendar week

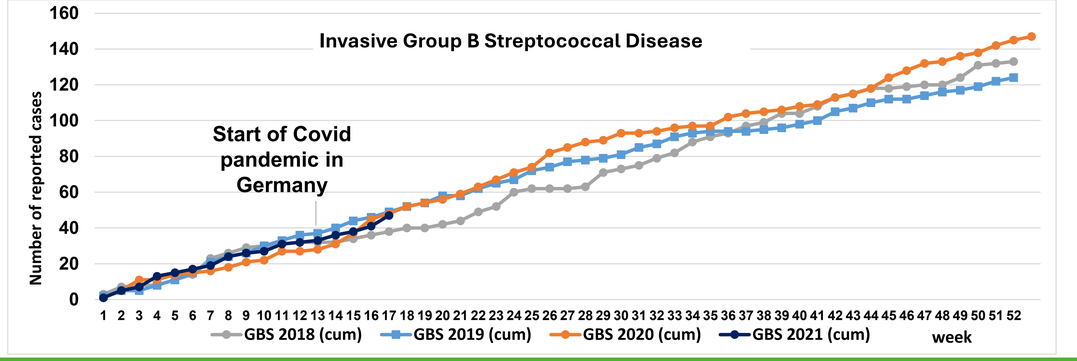

Fig. 3: Number of cases of invasive GBS disease in Germany per calendar week

CONCLUSIONS

- The herd protection effect of PCV7/PCV13 on serotype distribution of IPD among adults in Germany has reached its limit: PCV13 serotypes remain at a prevalence of about 30%.
- No herd protection can be noted for serotype 3, the most prevalent serotype in adults (2020-2021:19.2%).
- Our data implicate circulation of PCV13 serotypes among adults, which might only be interrupted by direct vaccination.
- The COVID pandemic has had a strong reducing effect on IPD, most probably through reduced respiratory transmission, however, pneumococcal vaccination of adults remains of utmost importance.