# Incidence and risk factors for new-onset diabetes mellitus (NODM) in post-pancreatectomy patients diagnosed with pancreatic adenocarcinoma (PAC): A systematic review

### SUPPLEMENTARY MATERIALS

# **Supplementary File 1**

# Quality assessment in the methods

### **Methods**

We performed the critical appraisal using the Newcastle-Ottawa Quality Assessment Scale for cohort studies [13].

# **Quality assessment for Cohort studies:**

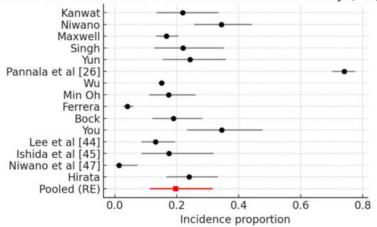
Study ID			Ascertainment of exposure	Demonstration that the outcome of interest was not present at the start of study	Comparability	Assessment of outcome	Time of follow- up	Adequacy of follow up	Total score (stars)
Kanwat et al. [18]	1	0	1	1	0	1	1	1	6
Niwano et al. [19]	1	0	1	1	0	1	1	1	6
Maxwell et al. [20]	1	0	1	1	1	1	1	1	7
Singh et al. [21]	1	0	1	1	0	1	1	1	6
Yun et al. [22]	1	0	1	1	0	1	1	1	6
Pannala et al. [23]	1	1	1	1	1	1	1	1	8
Wu et al. [24]	1	0	1	1	0	1	1	1	6
Min Oh et al. [25]	1	1	1	1	1	1	1	1	8
Ferrera et al. [26]	1	1	1	1	1	1	1	1	8
Bock et al. [27]	1	0	1	1	0	1	1	1	6
You et al. [28]	1	0	1	1	0	1	1	1	6
Imamura et al. [29]	1	0	1	1	0	1	1	1	6
Tariq et al. [30]	1	1	1	1	0	1	1	1	7
Kang et al. [31]	1	0	1	1	0	1	1	1	6
Shirakawa et al. [32]	1	0	1	1	0	1	1	1	6
Shen et al. [33]	1	0	1	1	0	1	1	1	6
Izumo et al. [34]	1	0	1	1	0	1	1	1	6
Wu et al. [35]	1	1	1	1	1	1	1	1	8
Kwon et al. [36]	1	1	1	1	1	1	1	1	8
Malleo et al. [37]	1	1	1	1	0	1	1	1	7
Stuthfield et al. [38]	1	0	1	1	0	1	1	0	5
Chari et al. [39]	1	0	1	1	0	1	1	0	5
Adam et al. [40]	1	0	1	1	1	1	1	1	7
Lee et al. [41]	1	1	1	1	1	1	1	1	8
Ishida et al. [42]	1	1	1	1	1	1	1	1	8
	Kanwat et al. [18] Niwano et al. [19] Maxwell et al. [20] Singh et al. [21] Yun et al. [22] Pannala et al. [23] Wu et al. [24] Min Oh et al. [25] Ferrera et al. [26] Bock et al. [27] You et al. [28] Imamura et al. [29] Tariq et al. [30] Kang et al. [31] Shirakawa et al. [32] Shen et al. [33] Izumo et al. [34] Wu et al. [35] Kwon et al. [36] Malleo et al. [37] Stuthfield et al. [38] Chari et al. [39] Adam et al. [40] Lee et al. [41]	Study ID         of the exposed cohort           Kanwat et al. [18]         1           Niwano et al. [19]         1           Maxwell et al. [20]         1           Singh et al. [21]         1           Yun et al. [22]         1           Pannala et al. [23]         1           Wu et al. [24]         1           Min Oh et al. [25]         1           Ferrera et al. [26]         1           Bock et al. [27]         1           You et al. [28]         1           Imamura et al. [29]         1           Tariq et al. [30]         1           Kang et al. [31]         1           Shirakawa et al. [32]         1           Shen et al. [33]         1           Izumo et al. [34]         1           Wu et al. [35]         1           Kwon et al. [36]         1           Malleo et al. [37]         1           Stuthfield et al. [38]         1           Chari et al. [39]         1           Adam et al. [40]         1           Lee et al. [41]         1	Study ID         Representative cohort         of the non-exposed or less-exposed cohort           Kanwat et al. [18]         1         0           Niwano et al. [19]         1         0           Maxwell et al. [20]         1         0           Singh et al. [21]         1         0           Yun et al. [22]         1         0           Pannala et al. [23]         1         1           Wu et al. [24]         1         0           Min Oh et al. [25]         1         1           Ferrera et al. [26]         1         1           Bock et al. [27]         1         0           You et al. [28]         1         0           Imamura et al. [29]         1         0           Tariq et al. [30]         1         1           Kang et al. [31]         1         0           Shirakawa et al. [32]         1         0           Shen et al. [33]         1         0           Izumo et al. [34]         1         0           Wu et al. [35]         1         1           Kwon et al. [36]         1         1           Malleo et al. [37]         1         1           Kwon et al. [39]         1 <td>Study ID         Representative cohort         of the exposed cohort         Ascertainment of exposure of exposu</td> <td>Study ID         Representative of the exposed cohort         Selection of the none sposed or exposed or exposure cohort         Ascertainment of exposure at the start of exposure at the start of suddy.           Kanwat et al. [18]         1         0         1         1           Niwano et al. [19]         1         0         1         1           Maxwell et al. [20]         1         0         1         1           Singh et al. [21]         1         0         1         1           Yun et al. [22]         1         0         1         1           Pannala et al. [23]         1         1         1         1           Wu et al. [24]         1         0         1         1           Min Oh et al. [25]         1         1         1         1           Ferrera et al. [26]         1         1         1         1           Bock et al. [27]         1         0         1         1           You et al. [28]         1         0         1         1           Imamura et al. [29]         1         0         1         1           Kang et al. [31]         1         0         1         1           Shirakawa et al. [32]         1         0</td> <td>Study ID         Representative cohort         Selection of the exposed cohort         Ascertainment of exposed of</td> <td>Study ID         Representative of the exposed of the exposed of the exposed of exposed or sevention.         Secretation of the exposed of exposed or interest was always.         that the outpersent interest was always.         Comparability of success and present interest was always.         Assessment interest was always.         Comparability of success and present interest was always.         Assessment interest was always.         Assessment interest was always.         Assessment interest was always.         Assessment was always.         Assessment interest was always.         Assessment interest was always.         Assessment interest was always.         Assessment was always.</td> <td>Study IDRepresentable of the expose of the expose of other exposed or other exposed or other exposed or exp</td> <td>Study ID         Representable of the exposed of the exposed of speed of seven color of the exposed of seven color of seven color of seven color of study         that the outcome of the exposed of seven color of study         Comparability of seven color of study         Now provided the exposed of seven color of study         Comparability of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of seven color</td>	Study ID         Representative cohort         of the exposed cohort         Ascertainment of exposure of exposu	Study ID         Representative of the exposed cohort         Selection of the none sposed or exposed or exposure cohort         Ascertainment of exposure at the start of exposure at the start of suddy.           Kanwat et al. [18]         1         0         1         1           Niwano et al. [19]         1         0         1         1           Maxwell et al. [20]         1         0         1         1           Singh et al. [21]         1         0         1         1           Yun et al. [22]         1         0         1         1           Pannala et al. [23]         1         1         1         1           Wu et al. [24]         1         0         1         1           Min Oh et al. [25]         1         1         1         1           Ferrera et al. [26]         1         1         1         1           Bock et al. [27]         1         0         1         1           You et al. [28]         1         0         1         1           Imamura et al. [29]         1         0         1         1           Kang et al. [31]         1         0         1         1           Shirakawa et al. [32]         1         0	Study ID         Representative cohort         Selection of the exposed cohort         Ascertainment of exposed of	Study ID         Representative of the exposed of the exposed of the exposed of exposed or sevention.         Secretation of the exposed of exposed or interest was always.         that the outpersent interest was always.         Comparability of success and present interest was always.         Assessment interest was always.         Comparability of success and present interest was always.         Assessment interest was always.         Assessment interest was always.         Assessment interest was always.         Assessment was always.         Assessment interest was always.         Assessment interest was always.         Assessment interest was always.         Assessment was always.	Study IDRepresentable of the expose of the expose of other exposed or other exposed or other exposed or exp	Study ID         Representable of the exposed of the exposed of speed of seven color of the exposed of seven color of seven color of seven color of study         that the outcome of the exposed of seven color of study         Comparability of seven color of study         Now provided the exposed of seven color of study         Comparability of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color of study         Now provided the exposed of seven color

26	Shaw et al. [43]	1	1	1	1	1	1	1	1	8
27	Niwano et al. [44]	1	1	1	1	1	1	1	1	8
28	Maxwell et al. [45]	1	1	1	1	1	1	1	1	8
29	Maignan et al. [46]	1	1	1	1	0	1	0	1	6
30	Wang et al. [47]	1	1	1	1	1	1	1	1	8
31	Yoo et al. [48]	1	1	1	1	1	1	1	1	8
32	Schranz et al. [49]	1	1	1	1	1	1	1	1	8
33	Thomas et al. [50]	1	1	1	1	1	1	1	1	8
34	Hamad et al. [51]	1	1	1	1	1	1	1	1	8
35	Yamada et al. [52]	1	1	1	1	1	1	1	1	8
36	Yamamoto et al. [53]	1	1	1	1	1	1	1	1	8
37	Mayeux et al. [54]	1	1	1	1	1	1	1	1	8
38	Lee et al. [55]	1	1	1	1	1	1	1	1	8
39	Kusakabe [56]	1	1	1	1	1	1	1	1	8
40	Karlin et al. [57]	1	1	1	1	0	1	1	1	7
41	Nguyen et al. [58]	1	1	1	1	1	1	1	1	8
42	Elliott et al. [59]	1	1	1	1	1	1	1	1	8
43	Burkhart et al. [60]	1	1	1	1	1	1	1	1	8
44	Hirata et al. [61]	1	1	1	1	1	1	1	1	8
45	White et al. [62]	1	1	1	1	0	1	1	1	7

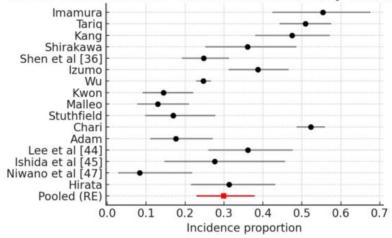
# **Supplementary File 2**

### A. Incidence rates

Forest plot: NODM incidence after Pancreaticoduodenectomy (PD) (Random-effects pooled)



Forest plot: NODM incidence after Distal Pancreatectomy (DP) (Random-effects pooled)

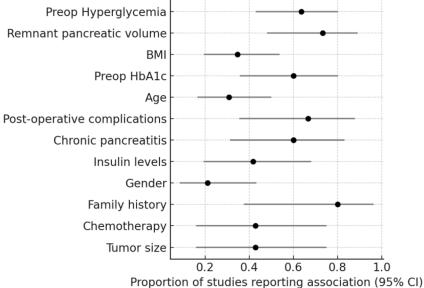


For Pancreatico-Duodenectomy (PD) group, the pooled incidence is 23.2% with 95% CI: 11.4% to 31.6%, with large heterogeneity.

For Distal pancreatectomy (DP) group, the pooled incidence is 26.3% with 95% CI: 22.9% to 37.9% with moderate heterogeneity.

# B. Risk factor analysis

Weight of evidence: proportion of studies reporting each factor associated with NODM



# Factors with the strongest weight of evidence

- 1. Preoperative hyperglycemia analysed in 22 studies; reported associated in 14 studies. Proportion = 64% (95% CI  $\approx$  46–78%).
- 2. Remnant pancreatic volume analysed in 15; reported associated in 11. Proportion = 73% (95% CI  $\approx 46-89\%$ ).
- 3. BMI analysed in 26; reported associated in 9. Proportion = 35% (95% CI  $\approx$  21–52%).
- 4. Preop HbA1c analysed in 15; reported assoc in 9. Proportion = 60% (95% CI  $\approx 36-79\%$ ).
- 5. Age analysed in 26; reported assoc in 8. Proportion = 31% (95% CI  $\approx$  18–47%).
- 6. Post-operative complications (e.g., POPF/infections) analysed in 9; reported assoc in 6. Proportion = 67% (95% CI  $\approx$  37–88%).
- 7. Chronic pancreatitis analysed in 10; reported assoc in 6. Proportion = 60% (95% CI  $\approx 31-83\%$ ).

# **Supplementary File 3**

### **Search strategy**

The detailed search strategy for the included studies, formatted according to the Peer Review of Electronic Search Strategies (PRESS) guidelines as follows

## **PubMed Search Strategy**

(("diabetes mellitus" [MeSH Terms] OR ("diabetes" [All Fields] AND "mellitus" [All Fields]) OR "diabetes mellitus" [All Fields]) AND ("pancreatic neoplasms" [MeSH Terms] OR ("pancreatic" [All Fields] AND "neoplasms" [All Fields]) OR "pancreatic neoplasms" [All Fields] OR ("pancreatic" [All Fields] AND "cancer" [All Fields]) OR "pancreatic cancer" [All Fields]) AND ("pancreatectomy" [MeSH Terms] OR "pancreatectomy" [All Fields] OR "pancreatectomies" [All Fields])) AND (systematicreview [Filter])

Translations
diabetes mellitus: "diabetes mellitus" [MeSH Terms] OR ("diabetes" [All Fields] AND "mellitus" [All Fields]) OR "diabetes mellitus" [All Fields]
pancreatic cancer: "pancreatic neoplasms" [MeSH Terms] OR ("pancreatic" [All Fields] AND "neoplasms" [All Fields]) OR "pancreatic neoplasms" [All Fields] OR ("pancreatic" [All Fields])
AND "cancer" [All Fields]) OR "pancreatic cancer" [All Fields]
pancreatectomy: "pancreatectomy" [MeSH Terms] OR "pancreatectomy" [All Fields] OR "pancreatectomy" [All Fields]]